S. Sutton Rawlinson

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No. CXVI.

Recent Patents.

To John Rostron, *of Edenfield, Lancaster, manufacturer, for certain improvements in the construction of looms for weaving.*—[Sealed 30th April, 1839.]

These improvements in the construction of looms for weaving, consist, principally, in the application of a novel and peculiar arrangement of mechanism, for the purpose of affording a much greater extent and variety of operations in those parts of looms which are employed to form or work patterns or devices, in the cloth or fabric to be woven; that is, in the working of the harness or healds, which, in connection with the suitable actions of the treadles and jacks, effect the requisite shedding of the warp threads to produce the pattern.

These improvements are applicable to the weaving of any description of plain or twilled fabrics, but more par-

ticularly to figure or fancy looms for weaving patterns or devices in or upon the cloth or other fabric; and are principally intended to supersede the "Jacquard," or any similar figuring apparatus. They have also for their object, a great economy in the cost of material and expense of labour, in effecting the requisite changes of patterns, by a ready mode of altering or removing those working parts of the loom which produce the design, by their action upon the jacks and treadles, which shift the healds or harness; and, consequently, by the use of an endless chain, of any extent, possess the capability of producing an extended range of pattern before it is necessary to repeat the shedding, or recommence the same series of operation upon the harness, commonly called, "renewing the round."

These improvements are effected by the application of an endless or continuous chain of tappets, of a novel and peculiar construction, formed by a succession of side links, connected by transverse spindles or bolts, upon or round which are placed, at suitable distances apart, small bowls or rollers, as tappets of various widths, turning loosely, or otherwise, upon such spindle; which bowls or rollers are separated by collars or tubes, of various lengths, according to the distances required between such tappets. An endless or continuous chain, so constructed as hereafter described, is to be suitably applied to the loom, for the purpose of "throwing out" certain parts of the mechanism connected with the jacks and treadles, and with their lifting and depressing apparatus, by means of the bowls or rollers, as the continuous chain revolves, pressing against certain rods, bars, or levers, called "jack-lifters," connected with the jacks above, and the treadles below; which will by these means throw out or disengage at the proper periods, certain jack-lifters from the action of the lifting and depressing apparatus, and leave certain others of them to be

brought or conducted, by suitable wires or strings, under the operation of the lifting and depressing apparatus; by which means, the harness or healds will be caused to shed or divide the warp threads as required.

The improvements represented in the drawings, Plate I., are shewn as applied to a power loom, for weaving fustians; but, it will be quite evident to the practical weaver, that they are equally applicable to any other construction of power or hand looms, wherein the "Jacquard," or any other similar apparatus, has usually been employed to produce the pattern or figure.

Fig. 1, represents, in elevation, the back part of a power loom, for weaving fustian; fig. 2, is an end elevation; fig. 3, a front elevation; and fig. 4, a plan or horizontal view of the same, as seen from above; in all which, the improved combinations of mechanism or apparatus, for producing the figure or pattern, is shewn applied to the side of the loom. Fig. 5, is a front, and fig. 6, a side view of the improvements, represented detached from the loom, upon an enlarged scale. Figs. 7 and 8, represent a portion of the peculiar construction of an endless chain, which constitutes the essential feature of novelty in the application of these improvements. Figs. 9 and 10, represent detached front and side elevations of a portion of the improved mechanism for driving the chain, somewhat differently modified from that shewn at figs. 1 to 6. This, it will be perceived, is similar, in principle, to the former, but is represented in order to shew the method of attaching these improvements to the looms of the old construction.

In figs. 1, 2, 3, and 4, *a, a, a, a,* represent the side and cross framing of the lôom, which supports the warp-beam *b, b*; from whence the warp threads pass over the guide or tension roller *c,* through the healds *d, d,* over the breast-

beam *e*, and around the work or cloth-beam *f, f*, also supported in the framing *a*; *g, g*, is the vibrating lathe or slay, carrying the reed for beating up the work, which is actuated by the crank-shaft *h*, and driving pulley *i*, as usual; the harness or healds *d, d*, being suspended from the jacks *j, j*, and connected to the treadles *k, k*, below.

A ratchet wheel *n*, is keyed fast upon a horizontal shaft *o, o*, extending through about the centre of the loom, and which is supported on the upright side frames *a, a*.

Now, as the lathe *g*, vibrates backward and forward, (driven by the rotation of the crank-shaft *h*, and the connecting links *l, l*,) a ratchet or draw-catch *m*, attached to the arm of the lathe, and taking into the ratchet-wheel *n*, on the shaft *o*, draws or pulls that wheel and shaft round one tooth at every beat of the lathe.

Upon each end of this shaft *o, o*, there are also keyed tappets or notched wheels *p, p*; and it will be seen in the plan, fig. 4, that, as these tappet-wheels *p, p*, revolve, they alternately present their projecting portion to one or the other of the small bell-crank levers *q, q*; and, by striking the bell-crank lever, cause the picking sticks *r, r*, attached to it by a strap, to impel the shuttle *s*, across the shuttle race, and thereby put in the weft or shute; whilst the notched space upon the other tappet-wheel *p*, at the reverse end of the shaft, clears the crank, and so on alternately.

This horizontal shaft *o, o*, also carries, at its extremity, a bevel toothed wheel *t, t*, which gears into a corresponding pinion *u*, of half of its diameter, (see the enlarged and detached figs. 5 and 6,) in order to obtain a quick action of the chain bowls upon the jack-lifters, during the interval of shedding the warp threads. The pinion *u*, is fixed upon the end of a small transverse shaft *v*; this shaft having semicircular flutes, or recesses, made longitudinally in its periphery. In these cylindrical flutes or recesses, and

around this shaft *v*, the endless chain *w*, *w*, passes, being driven by means of the bevel wheels *t*, and *u*, and kept in its proper situation by the flanges *v*,* upon the shaft *v*; the bowls or rollers $w,^1$ $w,^1$ of which it is partly composed, lying in the fluted recesses of the said shaft.

The peculiar construction of this endless chain, will be clearly understood by referring to figs. 7 and 8. It is composed of separate side lengths A, A, which are jointed or connected together by means of the bolt or spindle B, B, passed through their eyes. On these spindles are placed the small rollers or bowls C, C, which are allowed to turn loosely, or otherwise, upon the spindles; the rollers or bowls being kept at any required distance asunder, by means of small loose tubes, collars, or washers D, D, slipped upon the spindles between the rollers or bowls.

Links made of light plate-iron have been used, punched out to the required form; the spindles of iron wire; the collars or washers of ordinary thin sheet-iron tubing; and the bowls or rollers of pot or earthenware, glass, iron, or any other metal, or wood, or other suitable material; but those made from pot or earthenware, are decidedly the best and cheapest.

It will be evident, that such being the simple construction of the chain, the positions, breadths, and numbers of the rollers or bowls, and the length of the intervening tubes or collars, may be very readily varied, by shifting them upon the spindles, and thereby alter, at pleasure, the pattern to be woven. It will also appear to persons conversant with weaving machinery, that upon the positions, breadths, and numbers of these rollers or bowls, the pattern to be woven must depend.

The use and effect of the endless chain upon the working of the loom, is described as follows:—The horizontal fluted shaft *v*, around which the chain is passed, and by which it

is conducted, having, by the bevelled or spur gearing, advanced the chain one length at every beat of the lathe, it will be obvious, that the bowls $w,^1$ $w,^1$ will, successively, come in contact with, and press against, the sides or edges of the jack-lifters x, x, exactly at the periods when the bowls pass the horizontal place of the centre of the shaft v, and thereby project, or, as it is commonly termed, throw out the jack-lifters x, x; the bowls or rollers being combined or prepared of various breadths, in order that they may, at each operation, act against any number of jack-lifters which the intended pattern may require.

The jack-lifters x, x, are connected, at their upper ends, to the jacks j, j, above, and by conducting strings or wires $y,^*$ $y,^*$ to the treadles k, k, below. These jack-lifters are formed each with four hooks or bearings, two being upon each side for the purpose of actuating the jacks and treadles for effecting the shedding or opening of both sheds of the warp simultaneously.

There is a comb-bar fixed in the framing, (seen in section at 13, in fig, 6,) having partitions for the purpose of separating the jack-lifters x, x, and keeping them always opposite to the acting peripheries of the chain bowls or rollers; and the back of this bar forms a guide, conducting the chain, and preventing it from interfering with the jack-lifters below the horizontal plane of the shaft v. This comb-bar is provided with two lock-nuts, for the purpose of adjusting it. The jack-lifters are to be raised and depressed by the transverse bars $y,^1$ and $y,^2$ shewn attached to vertical slide-rods z, z, in fig. 5, and in section in fig. 6, in which two of the jack-lifters only are represented.

In this last-mentioned figure it will be observed, that by the action of the chain bowls the jack-lifter x, is thrown out of the reach of the lifting-bar $y,^1$ as it ascends, represented by dotted lines, and thus thrown into a suitable

position to be depressed by the bar $y,^2$ whilst the other jack-lifter x, by the stringing $y,^*$ is brought into a suitable position to be raised by the bar $y,^1$ as it descends. Thus it will be understood, that those jacks and treadles with which the jack-lifters $x,^1$ are acted upon by the descending bar $y,^2$ in connection, will constitute rising threads in the warp, and those jacks and treadles connected to the jack-lifter x, which are acted upon by the raising-bar $y,_1$ will constitute sinking threads in the warp; and thus, by their operation on the warp, produce the pattern in the fabric as the weaving proceeds. The raising and depressing-bars $y,^1$ and $y,^2$ slide vertically in mortices in the frame attached to the loom side, as seen in fig. 6, and are affixed, by their adjusting screws, to the two upright rods z, z, sliding also vertically in a part of the frame, as seen at fig. 1.

The alternate rising and falling movements of the bars $y,^1$ and $y,^2$ are performed simultaneously with the advance of the endless chain, by means of the crank or excentric pin 1, fixed in the side of the spur-wheel 2, upon the end of the crank-shaft h,—see figs. 2 and 4. As this wheel 2, revolves, the connecting-rod 3, attached by the link 4, to one of the two upright rods z, slides this rod up and down at each revolution; and the rods z, z, being connected together by means of straps, passing over pullies 5, and 6, cause the bars $y,^1$ and $y,^2$ to be raised and depressed alternately.

It must be here observed, that these raising and depressing-bars $y,^1$ and $y,^2$ are also peculiar in their form, being made taper; that is, narrowed from the back towards the front, as the hindermost healds will require to be separated farther apart than those in front, in order to bring all the warps of each distinct shed into coincidence; which has the peculiar effect of causing the shed to be evenly made throughout, instead of leaving any of the back warps loosely

or unevenly spread, which is of considerable importance, in order to leave a free and clear passage for the shuttle. And also, that there is a spring 7, pressing a piece of leather against the side, free of the driving bevelled wheel *t*, to produce friction, in order to prevent any rebound or overrun of the chain, and give steadiness to its motion.

It will be seen, that the jack-lifters *x*, *x*, are always kept close against and made to return to the action of the chain, by means of the conducting wires or strings *y*,* by which they are connected to the treadles, being placed obliquely, thereby dispensing with a spring, which would otherwise be required to each jack-lifter, in pattern looms, as hitherto used; and that the treadles only require a slight steadying motion to bring the healds level, when in the rest or quiet position, which is effected by the straps and pullies 8, also actuated by the spur-wheel 2, driving the wheel 9, and connecting link 10, or by any other suitable arrangement. And it will be perceived, that thus geared, the steadying motion may be readily adjusted to bring the treadles and jacks level or square in the rest position, or at any other required time.

By a simple alteration in the mode of working these improvements, another very important object can be obtained. By removing the link or arm 3, and substituting one of about double its length, the motion being communicated from the ordinary "taking-up" wheel 11, fixing the lower end of such arm to the pin 12, in the arm of the wheel 11, as shewn by the dotted line in fig. 2; and also by having an odd link, or two similar rows of rollers and collars, placed together in the same round in the endless chain *w*, *w*. A double number of shifts or changes to the round are effected, as each of the lifting-bars $y,^1$ and $y,^2$ having two hooks or bearings on either side, will thus per-

form both the lifting and depressing motion alternately. And as the taking-up wheel 11, only performs one revolution to two of the crank-shaft, the pattern will be thus woven upon both surfaces of the cloth, but in reversed positions. As for example:—In weaving a plaid of any required square or pattern, it will be seen, that when the crank-pin 12, in the wheel 11, is passing the horizontal plane of the centre of the wheel on that side represented in fig. 2, the first acting link or row of the bowls, in the endless chain, which forms the pattern, will throw out the required number of jack-lifters x, to the action of the depressing-bar $y,^2$; and by means of the conducting wires $y,^*$ cause the said disengaged jack-lifter to be brought against the opposite bar $y,^1$ ready to be raised. Thus it will be perceived, on the following revolution of the endless chain, the crank-pin, in the wheel 11, will, by passing the horizontal plane of the centre of the wheel 11, at the opposite side, (as shown by dotted lines in fig. 2,) cause those jack-lifters x, which were before depressed, to be lifted, and, consequently, produce the pattern reversed upon the cloth, and so on alternately.

The looms, thus arranged, may also be made to work two ordinary calico healds, for weaving stripes or ribs, or plain calico cloth or ground, by attaching their jacks direct to the lifting-bars $y,^1$ and $y,^2$ (shewn also by dots in fig. 2,) in conjunction with any pattern to be effected by the endless chain.

In those cases where it is desirable to attach these improvements, for producing the pattern or figure, to old looms, it is only necessary to adopt the method represented in figs. 9 and 10, wherein the whole of the apparatus, connected with the chain, for producing the figure, will be found to be the same as already described, excepting in

the mode of driving. In these figures 9 and 10, the motion, for working the chain, is to be communicated directly from the ordinary crank-shaft of the loom *a*, by means of the excentric *b*, crank *c*, and slide-rod *d*. Upon this slide-rod *d*, the draw-catch *e*, is attached, for pulling round the ratchet-wheel *f*, and driving the chain by means of the toothed wheel and pinion *g*, and *h*, when the operation of the loom will proceed, as before explained.

The patentee states, "I claim, exclusively, the peculiar construction of the endless chain, composed of side links, spindles or bolts, tubes, washers or collars, and rollers or bowls, revolving loosely, or otherwise, and capable of being readily changed and adjusted, of whatever material they may be constructed, as shewn particularly in figs. 5, 6, 7, and 8, for producing the pattern or figure upon the cloth or fabric, in looms for weaving; and the application of such thereto; and also its employment in conjunction with the taper-formed lifting and depressing-bars or arms $y,^1$ and $y,^2$ working in combination with the vertical sliding-rods *z*, *z*, for actuating the jacks and treadles; also in combination with the jack-lifters, provided with two hooks or bearings on each side; that is, on the back and front, in order to perform the requisite and even shedding of the warp threads.

"And, further,—the manner of stringing and connecting the jack-lifters to the treadles, by placing the conducting strings or wires $y,^4$ inclined out of the perpendicular, in order to dispense with the necessity of separate springs, in such or similar situations in looms for weaving."—[*Inrolled in the Rolls Chapel Office, October,* 1839.]

To William Hale, *of Greenwich, in the county of Kent, civil engineer, for his invention of certain improvements in machinery, applicable to vessels propelled by steam or other power; which improvements, or parts thereof, are applicable to other useful purposes.*— Sealed 22nd March, 1836.]

The patentee proposes, by the friction, in passing of what he calls a strap or band of water, to give rotary motion to a drum, from the axle of which, a driving power is to be derived for propelling vessels, or actuating other machinery.

Plate II., fig. 1, represents, in vertical section, a furnace, in connection with which the apparatus is erected. *a*, is the fire-place, from whence the flame and heated vapour passes round a circular flue *b*. In the centre of this flue, a cylindrical vessel *c, c, c*, is fixed, and within it another cylindrical vessel or drum *d*, mounted upon an axle *e*, is enabled to turn freely. Between the outer cylinder *c, c, c*, and the inner cylinder *d*, there is a narrow space or channel, which is to be filled with water. The water is to be forced into this channel by a pump, connected to the pipes *f*; and, after circulating round the passage between the two cylinders, it will be interrupted by a stop *i*, and pass off by the pipe *g*. It is intended that the water, in its course, shall, by its friction against the surface of the cylinder *d*, give rotary motion to that cylinder; the power derived from which, is to be communicated through the axle *e*, to drive other machinery.

So far, we understand the patentee's intentions, but deny the possibility of producing an available power by any such means. We do not, however, clearly perceive what is intended to be the effect of the fire, acting on one side of the cylinder *c*; nor do we comprehend what is meant by con-

densing, in the pipe *g*, as steam is not described as the agent, but what the patentee calls the channel or band of water, acting as a strap, passed round the inner drum, which is thereby to be considered as a pulley.

Another modification of the contrivance is shewn in fig. 2; in which, a conical chamber is shewn, and within it is mounted a cone, having a spiral thread or worm coiled round it. Scarcely any explanation of this figure is given, but it is easily understood that the water is to be forced in at bottom, and by acting against the inclined plane of the spiral thread or worm, the cone is intended to be made to revolve, which we presume would be the effect; but with what advantage we know not.—[*Inrolled in the Inrolment Office, September,* 1835.]

To HENRY JAMES PIDDING, *of Osnaburgh-street, in the county of Middlesex, artist, for improvements in collars for horses and other animals,—being a communication from a foreigner, residing abroad.*—[Sealed 27th September, 1839.]

THIS improved collar is constructed upon an iron frame, which gives the collar sufficient rigidity, in itself, to allow of dispensing with the ordinary moveable hames, there being arms carried out from the sides of the frame through the padding, to which the traces are to be attached.

The two sides of the frame are connected together, at top, by a hinge joint, and are capable of opening at bottom, under the throat, by eyes or sockets, at the ends of the frame, sliding upon a straight rod or bar. By these means the collar may be expanded, in width, to suit the neck of any horse; and may be widened, when required, to facilitate the passage of the collar over the horse's head.

Plate II., fig. 1, represents the framing of the collar without its padding. *a, a,* are the side frames; *b,* the hinge-joint, upon which the frames open; *c, c,* are eyes at the lower ends of the arms, through which the straight part of a ring *d,* passes. These eyes are circular, with a small notch cut in each; and upon the upper side of the straight part of the ring *d,* there are small teeth, which, when the ring is raised up, are enabled to slide through the notches of the eyes, and thereby allow the frames to be extended; but when the ring hangs down, as in the figure, the teeth bearing against the sides of the eyes, confine the frames at any distance apart to which it may be desired to expand the collar, to suit the neck of the horse.

Another modification of the lower connecting parts of the framing, is shewn at fig. 2; in which, instead of the ring *d,* a straight bar is employed, sliding into sockets at the ends of the frames; by means of which, the collar may be opened or closed to any extent within the length of the bar.

The patentee states, that he claims, firstly,—applying a frame, and dispensing with the ordinary moveable hames; and secondly,—applying a frame when the collar is made to open for the purpose of extending or contracting it.——[*Inrolled in the Inrolment Office, March,* 1840.]

To Luke Hebert, *of Paternoster-row, in the city of London, for improvements in horse collars,—being a communication from a foreigner, residing abroad.*—[Sealed 9th May, 1836.]

These improvements are designed to afford the means of expanding and contracting a collar, so that it may be made to fit the neck of any horse, whether large or small.

The framing of the collar is of metal, and it has an opening joint at the throat, and another at the top of the neck. The side framings of the collar are made with sliding bars or rods, which work in sockets. By drawing down the sliding bar or rods of the side frames, the length of the collar is increased, and it is, at the same time, expanded in breadth also. In order that the collar may retain its external form, however much expanded, its outer surface is a shield of strong leather, which is made capable of sliding one part within the other, like a telescope.

The sliders are held fast by thumb-screws, bearing upon or inserted into the metal framing, so that when the collar has been expanded to the desired size, its parts are all made firm by the thumb-screws. The tug-hooks, and the eyes for the reins to pass through, are fixed into the metal framing.—[*Inrolled in the Inrolment Office, November,* 1836.]

To Edward Keele, *of Titchfield, in the county of Southampton, brewer, for his invention of an improved valve and apparatus for close fermenting and cleansing porter, beer, ale, wine, spirits, cider, and all other saccharine and fermentable fluids.*—[Sealed 7th June, 1834.]

This improved apparatus consists, firstly, of a valve, which we suppose is to be inserted into the bung-hole of a cask, and weighted according to the resisting pressure required; and secondly,—a method of suspending, to a weighted lever, the cap or cover for the man-hole of a tank.

These things are represented in very rough and uncouth drawings, appended to the specification; amended copies of which are shewn in Plate II.

Fig. 1, represents an apparatus, of which very little description is given, except that *a*, is the valve; *b*, a shield; *c*, *d*, and *e*, weights, placed upon the stem *f*. We presume, that the part *a*, is to be passed into the bung-hole of a cask, and that the part *b*, is to support it by bearing upon the outside of the cask; that the weights *c*, *d*, and *e*, placed upon the stem *f*, are to be used, as occasion may require, for keeping down the valve, and thereby preventing the escape of the carbonic acid gas from the liquor, under any desired pressure.

Fig. 2, shews the contrivance for raising and lowering the cap or cover of the man-hole of a tank. It is placed upon a weighted lever, by which it is balanced; and when let down on to the man-hole, is made fast thereto by screws.

A tool, shewn at fig. 3, is called a "rummager;" it is stated to be for scraping up the yeast which may happen to flow over.—[*Inrolled in the Petty Bag Office, November*, 1834.]

To JACOB TILTON SLADE, *of Carburton-street, Fitzroy-square, in the county of Middlesex, gent., for his invention of an improved metallic sheathing for the bottoms of ships or vessels.*—[Sealed 25th November, 1834.]

THIS improved metallic sheathing is produced by plates of copper, coated with lead. In preparing these plates of copper,—they are first to be tinned by the ordinary process; then, previously to applying the lead, one side of the plate is to be covered with a plaster, made of clay and wheaten flour paste. When this plaster has become dry, the plate is to be dipped into moulten lead, which will adhere to the tinned surface of the plate, and produce the improved me-

tallic sheathing,—the paste being removed by soaking the plate in water.

If it should be required to give a very thick coating of lead to the plate, it may, for that purpose, be placed in a mould, formed by two flat plates of iron; one of them having a ledge at its lower edge. That side of the tinned copper plate which has been covered with the plaster, is to be laid flat upon the mould, and then two or three strips of steel, of the substance of the required coating of lead, is to be laid upon the tinned surface of the copper plate, for the purpose of forming a space between it and the outer iron plate of the mould. The whole is then to be immersed in the melted lead, which will flow into the space between the plates, and attach itself to the surface of the tinned copper, and before the lead is completely set, the strips of steel are to be withdrawn, which will leave the copper plate coated with lead of the required thickness.

The plate being then withdrawn from the iron mould, and the plaster removed, by soaking in water, the improved metallic sheathing is fit for use.—[*Inrolled in the Petty Bag Office, May,* 1835.]

To ANDREW SMITH, *of Princes-street, Leicester-square, in the county of Middlesex, mechanist and engineer, for his invention of a new and improved method of preparing phormium tenax, hemp, flax, and other fibrous substances, and rendering the same fit for heckling in the manufacture of linen, and for spinning in the manufacture of ropes, cordage, lines, and twines.*—[Sealed 24th May, 1834.]

THIS invention applies, principally, to the preparation of phormium tenax, (New Zealand flax,) and is a mode of

discharging the hard outer crust or coating of the plant, in order that it may be rendered fit for heckling and spinning.

The flax, if treated in its green state, is to be boiled in a strong solution of alkali, such as soap lees, until its pulp becomes soft. It is then to be passed between a series of fluted rollers, for the purpose of breaking the fibres of the crust.

The machine employed for this purpose has no particular novelty in its construction. Three or four plated rollers are mounted, in horizontal positions, upon their axles, in a frame; and upon these, other similar rollers are placed and weighted, much in the same way as the rollers of a drawing frame. The flax, after being boiled, as stated, is to be passed between these fluted rollers, which are made to revolve with equal speed; and the flutes of the rollers, by bending and pinching the flax, as it passes, breaks the fibres of the outer coat, and thereby renders it easy of removal. The only peculiarity in the machine, pointed out by the patentee, is, that the rollers are to be of "three-sixteenths pitch."

After the rolling process, the flax is to be again immersed in the solution of alkali, heated from about 90 degrees, and agitated therein, until the bark or outer coating is washed off. Then, on being cleansed in clear water, and afterwards dried, the flax will be fit for heckling and spinning.

If the material is to be operated upon in its dry state, it is first to be heated in a kiln, and then submitted to the rolling and washing, as above stated.—[*Inrolled in the Petty Bag Office, November,* 1834.]

To Henry Davies, *of Stoke Prior, in the county of Worcester, engineer, for his invention of certain improved apparatus or machinery for obtaining mechanical power; also certain improved apparatus or machinery for impelling or raising fluids.*—[Sealed 15th March, 1837.]

The patentee commences his specification by saying,—As I shall have occasion to describe various modifications of these constructions and arrangements, I will observe, that certain parts of the apparatus or machinery are similar in the several modifications; and that these parts are also similar to certain parts of a rotary engine, for which I, in conjunction with William Taylor, of Smethwick, in the county of Stafford, engineer, obtained His late Majesty's royal letters patent, dated the 26th day of April 1836; the specification of which was duly inrolled in His Majesty's High Court of Chancery; and to which specification I now refer, for the better illustration of my present invention.*

I would also observe, that one of the similar parts now referred to, was called, by way of distinction, (though not quite correctly,) in the said specification, the cylinder; and the other similar parts were called, respectively, the disc, the ball, and the piston plate; I shall, therefore, adopt the same names for these similar parts in my present specification.

The first improved construction and arrangement of apparatus or machinery I shall describe, as an improvement on the rotary engine, which is exhibited by the figures, in the drawings attached to the specification of the said William

* For description of former patent see Vol. XVIII., page 97, of our Journal,—Conjoined Series.

Taylor and myself, and fully described in the said specification.

This improvement consists in a method of adapting the induction and eduction ways or passages to what we call the cylinder of the engine, by means of a conical collar, through which the shaft of the working disc passes, the induction and eduction passages being formed within the cone, as will be more particularly described hereafter; and in an improved mode or method of packing the centre ball within the cylinder, to prevent the escape of steam or other fluid.

The several figures in Plate III., represent this my first improved construction. Fig. 1, is a horizontal section through the engine, on one side of the steam-stop, (or, as I call it, the piston,) taken in the direction of the dotted line a, b, in fig. 2, in order to shew perfectly the induction and eduction passages of the engine; fig. 2, is a vertical section, taken through the side casing of the engine, in the direction of the dotted line c, d, in fig. 1, for the purpose of exhibiting the induction and eduction ways or passages; fig. 3, is another similar section, taken in the line e, f, in fig. 1, for the same purpose; fig. 4, is a sectional representation of the interior of the engine, one-half of the periphery of the outer case or cylinder being removed, to expose the inlet and outlet passages in the conical side of the cylinder; figs. 5 and 6, are representations of the conical collar, detached from the engine on an enlarged scale, through which the ways or passages are formed; fig. 7, is a longitudinal section, taken vertically through the same, in the line g, h, in fig. 5.

A, B, are the two parts or halves of what I have called the cylinder, connected together in the manner described in the before-named specification of Taylor and Davies; C, is the shaft of the cylinder, turning in proper bearings; D,

is the steam-stop, or what I have called the piston; E, is the disc or plate, which divides the interior of the cylinder, and is securely connected with its ball G, to the shaft F, passing through the conical collar, and also turning in proper bearings; H, is the fixed or stationary conical collar, through which the induction and eduction passages are formed, and upon which the cylinder revolves, instead of the cone being fixed upon the cylinder, and revolving with it, as described in Taylor and Davies's before-named specification; I, is the induction, and K, the eduction passage, leading to and from the steam-box at L.

The operation of the engine is as follows:—Supposing the parts to be in the situation shewn in the figures, the steam or other impelling fluid will pass along the induction passage I, into the way or passage *a, a, a,* formed within and around the conical collar H; from whence it will pass through the way or passage *b, b,* formed within and around one-half of the conical side of the cylinder B, and enter the interior of the cylinder by the way or passage *c, c, c,* opening from the narrow way *b,* into the interior of the engine, close alongside of the transverse stop or piston D; and there, by exerting its impelling force upon the surface of the cylinder, stop or piston, and disc, will cause the disc to perform its required movements, as stated in the specification of Taylor and Davies, before referred to. At the same time, the steam or other fluid, which occupies the other part of the interior of the cylinder, will make its exit by the opening or way *d,* formed in the conical part of the cylinder, on the reverse side of the stop or piston D, and passing off by the other way or passage *e,* formed within and around the other half of the conical part B, of the cylinder, will enter the other way or passage *f,* formed within and around the conical collar H, and from thence escape by the exit pipe *k.* As soon as one half of the

interior or chamber of the cylinder has been filled with induction fluid, the change in the sides or chambers takes place; and that which has now been described as containing induction fluid, will be occupied with eduction; and the other half of the chamber which was occupied with eduction fluid, will be filled with induction, and so on; the half chambers being occupied, alternately, with induction and eduction fluid, thereby keeping up the continuous rotary motion of the engine, as described in the before-mentioned specification of Taylor and Davies.

In order that the conical collar H, may remain packed tight upon the ball G, in case of any wear, I have provided a packing or stuffing-box at M, around the induction and eduction pipes, which will allow of their being forced up to the ball by any convenient means. The packing on the other side of the ball G, is effected by metallic or other suitable packing at N; it may be formed as a cup, and fitted into a recess in the side A, of the cylinder. O, is a rod, passing through a hollow part of the shaft C, and is moved towards the ball, as required, by means of cotters or screws, at P.

My second improvement consists in the adaptation of the improved apparatus or machinery just described, to the purpose of impelling or raising water or other fluids, or to the purpose of impelling or forcing a blast of air or other gas.

This adaptation will be readily understood, when it is considered, that for such a purpose it is only necessary to communicate rotary motion to the cylinder, (so called,) by means of some motive power applied thereto; when an action will take place similar to that when the apparatus is used as an engine for obtaining power, and fluid will be drawn into the cylinder, through the induction passages, and expelled therefrom through the eduction passages.

The next modification I shall describe, of my improved

construction of apparatus and machinery, is applicable only to the purpose of impelling or raising fluids; and the construction of this is shewn in several figures.

In this construction, the cylinder (so called) is stationary, and must be placed in the fluid to be impelled, and motion is communicated to the disc by means of vibrating rods, which are driven by a crank, impelled by suitable motive power.

Fig. 8, is a side elevation of the engine, as constructed and arranged for this purpose; fig. 9, is a vertical section, taken in the dotted line a, b, in figs. 8, and 10; fig. 10, is a plan view of the interior of the engine, the upper half of the cylinder being removed to expose the parts; and fig. 11, is a detached representation of the disc, with its pin. A, B, are the two parts of the cylinder, which are fixed in any convenient manner; D, is the piston or stop; E, the disc or plate; G, the centre ball; F, the pin on the periphery of the disc, projecting through the slot I, formed in the side of the cylinder. To this pin, the cross arms or levers K, K, are securely attached; their extremities being connected to the rods L, L, jointed to the crank M, upon the shaft N, which is mounted, turning in proper bearings at O, O, and is to be actuated or set in motion by a rigger and band, passed from a steam-engine or other first mover, or by toothed gear, as most convenient. The slot or opening I, forms the induction passage, for the fluid, into the interior of the cylinder; the fluid having free access, through the slot, to both sides of the disc, next to one side of the piston or stop; and, as the disc is made to perform its oscillating movements, the fluid, on the other side of the piston or stop, is forced, by the disc, out of the interior of the cylinder through the exit passage P, and thence through the discharge pipe Q; the peculiar movements of the disc or plate being effected by the crank M, moving the pin F,

from side to side of the cylinder; at the same time, by means of the levers or arms K, the pin is turned, alternately, a portion of a revolution, and with it the disc, which is at all times, during its movements, kept in the same line or direction as the levers or arms K, K. I would here remark, that when this arrangement and construction of engine is to be used for impelling a blast of air to the furnace of a cupola, or for other purposes, the slot or opening I, will be left open to the atmosphere; and when it is to be used for impelling water or other liquid, it is to be immersed in the liquid to be impelled, so that the same has free access to the interior through the opening or slot I.

It will be observed, that in this application of the engine, there is no occasion for the ways or passages *c*, and *d*, formed in the disc or plate, next the stop or piston D, as in the former instances, when the engine is used as an engine for obtaining power, as the fluid has free access into the engine on both sides of the disc.

My fourth improvement consists in an improved construction, arrangement, or modification, of the above improved machinery or apparatus, to be applied to the purposes of a forcing engine for impelling fluids from one situation to another. In this modification, the dividing plate or disc is made stationary, with its central ball and shaft, (which are hollow, to form the induction and eduction passages for the fluid); the cylinder being made to perform the requisite movements, instead of the disc, by means of cranks and connecting rods applied to its exterior, and which may be actuated by a steam-engine, or other first mover.

The central ball is fixed or stationary, and is made hollow, with a partition, dividing it into two chambers or compartments; one of the chambers is open to a suction or supply pipe, and is furnished with an induction passage for the fluid

to the interior of the cylinder; and the other chamber or compartment has an opening or way for the exit of the fluid from the interior of the engine into the chamber of the ball, which is also open to the discharge pipe. The cylinder, with its piston or cross-plate, being made to perform an oscillating and vibrating movement on the ball, as a centre, by means of cranks and connecting rods, jointed to the outer periphery of the cylinder or case, and actuated by a steam-engine, water-wheel, or other first mover.

Fig. 12, is a top view of the forcing engine; fig. 13, is a vertical section of the same, taken in the line a, b, in fig. 12, shewing the interior, and the ways or passages of the engine, and the hollow ball; fig. 14, is a horizontal section, taken through the disc or plate and the hollow ball, in the line c, d, fig. 13; and fig. 15, is a section, taken through the ball, in the line e, f, in fig. 13. A, B, are the two parts of the engine; D, is the disc or plate, cast solid with the hollow ball G, which is divided by the partition *a*, into the two compartments *c*, *d*; the chamber *c*, is open to the supply pipe *e*, and to the interior of the cylinder, by the induction passage *f*, *f*, formed within the disc, by which the fluid makes its entrance into the interior of the cylinder, through the narrow slot or opening *g*, on one side of the piston or stop D, and fills this half or portion of the interior of the cylinder. The fluid occupying the other half or portion of the interior of the engine, makes its exit by the way or passage *h*, of the disc, on the other side of the piston or stop D, and flows by the eduction way *i*, of the disc, into the other chamber *d*, of the ball, and goes off by the exit or discharge pipe *k*. H, is a crank-shaft, to be mounted upon proper bearings or plummer-boxes, in any convenient situation, and actuated by means of toothed gear, or a rigger and band, passed from a steam-engine or other first mover. Upon this shaft are to be mounted two cranks or

excentrics I, I, connected by rods K, K, to the outer flanges or rims of the cylinder, by ball and socket, or other universal joints, at L, L,—the points of connection of the rods to the cylinder forming a right-angled triangle with the centre of the ball G; and as the crank-shaft H, is made to revolve, the cylinder will be made to move with a vibrating and oscillating movement, about the centre ball G, without its performing a rotary motion, whereby the fluid will be drawn up the supply pipe *e*, through the induction passages *f*, *f*, by the partial vacuum formed within the cylinder on the one side of the disc; and the fluid, occupying the other half of the cylinder, will be forced out by the disc through the eduction passages *h*, and *i*, and off by the discharge pipe *k*. The cylinder of the engine is packed around the ball G, at M, M, by metallic packing, or in any convenient manner.

In my fifth modification, the cylinder is made stationary, and the interior disc or plate is caused to perform its required movements, by means of a crank and connecting rods, applied to the edge or periphery of the plate, through a slot or opening in the cylinder. This modification consists in the application of the second described engine, for impelling or forcing fluids, without requiring that it should be placed in the fluid to be impelled,—the necessary alterations being made in the construction and arrangement, and adaptation of some of the parts for this purpose; for instance,—the slot or groove I, which is open in the former engine, is closed in this application, and a supply pipe adapted to the cylinder, on the opposite side of the piston or stop, to that next the discharge pipe,—the disc being made to perform its requisite movements by means of cranks and connecting rods, attached to cross levers or arms, on the pin on the periphery of the disc, in any convenient manner.

Fig. 16, is a side elevation of the engine; and fig. 17, is a partial cross section, to shew the cover of the slot I. A, B, are the two parts of the cylinder; F, the pin, fixed on to the periphery of the disc, to which the levers or arms K, K, are securely attached; the ends of the arms or levers being jointed to the connecting rods K,* K,* leading to the cranks on the shaft, to be put in motion by the steam-engine, or other first mover. I, I, is a sliding cover, fitting into dove-tailed grooves, formed across the cylinder, and is connected to the pin F, by a proper stuffing-box Q; by which means the cover is made to slide, with the pin, in its movements across the cylinder, and keep the aperture or slot I, closed. R, is the supply-pipe, leading to the interior of the engine; and S, is the discharge-pipe. The action of the working parts, in the interior of the engine, will be understood from those of the engine formerly described, and therefore, it is not necessary for me to repeat them.

And, in conclusion, I would remark, that I propose to cover the sides of the disc, and also the conical sides of the cylinder, with leather, in both blast and pumping engines, to prevent the escape of fluid past the junctions; and also to apply leather, or other packing, in all situations where it is requisite. And further, in conclusion, I would remark, that I claim, as my invention, first,—the improved construction and adaptation of induction and eduction ways or passages, as applied to the rotary engine of Taylor and Davies, before mentioned; and the mode of packing the centre ball within the cylinder thereof, as described in this my specification; secondly,—the adaptation of the said improved rotary engine, apparatus, or machinery, to the purpose of impelling or raising water or other fluids, or to the purpose of impelling or forcing a blast of air or other gas; and thirdly,—the various improved constructions of apparatus, machinery, or engines, applied to the purpose

of impelling or raising fluids, and described as my third, fourth, and fifth modifications, in this my specification, and shewn in the drawings hereunto annexed.—[*Inrolled in the Rolls Chapel Office, September*, 1837.]

To Edwin Turner, *of Leeds, in the county of York, engineer, for his invention of certain improvements, applicable to locomotive and other steam-engines.*— [Sealed 7th July, 1840.]

These improvements, applicable to locomotive and other steam-engines, consist in a peculiar mode of constructing a part of the boiler or steam generator, and its feeding apparatus, which is designed in order that the water, for supplying the boiler, may be forced through certain tubes, situate at the bottom of the furnace, (constituting hollow fire-bars,) and which, by that means, will become considerably heated before it enters the boiler, thereby greatly economizing the expenditure of fuel, and causing the steam to be generated with increased facility.

In the accompanying drawing, (see Plate II.,) fig. 1, represents a longitudinal elevation of a locomotive engine, shewing the arrangement of the tubes for conducting the water from the tank of the tender to the boiler, with the pumps for forcing it, and the cock and valve through which it passes, the hollow fire-bars being shewn in section; fig. 2, is a horizontal view of the same, exhibiting the transverse arrangement of the tubes, and of all the hollow fire-bars under the furnace; which last-mentioned, are shewn in section. The two longitudinal tubes *a, a,* conduct the cold water from the tender, through which tubes the water is drawn by the pumps *b, b,* in the usual manner; and these pumps also force the water so drawn through the

contorted tubes *c, c,* and their several valves or cocks, into the transverse tube *d,* which forms one end of the fire-grate. This transverse tube *d,* is a main tube, to which all the longitudinal tubular fire-bars *e, e, e,* are connected, with their reverse ends open into another transverse tube *f,* forming, together, the entire grating or bottom of the furnace. The water injected by the contorted tubes *c, c,* is thus made to flow through all the fire-bars or tubes *d, e,* and *f,* and, becoming heated in its progress by the contiguity of the furnace, passes into the branch tubes *g, g,* and thence through the cock *h,* into the boiler *i, i,* in nearly a boiling state.

The manner of constructing the tubular grating will be sufficiently understood by inspecting the drawings; the longitudinal fire-bars *e, e, e,* being inserted into the transverse tubes *d,* and *f.* At the end of each hollow fire-bar there is a plug *k,* screwed into the transverse tube *d,* which may be removed, when required, for the purpose of cleaning out the tubes; and at the ends of the transverse tube *f,* there are similar screw-plugs *l, l,* for the same purpose.

In the event of the fire-bars being at any time out of order, the passage of the water through them may be cut off, by shutting the cock *h,* in the branch tubes, and also closing the cocks *m, m,* in the conducting pipes *c, c.* When this is done, the cock *n,* in the transverse tube *o, o,* must be opened, which will then allow the pumps *b, b,* to inject the water immediately into the boiler in the ordinary way.

The patentee states,—I do not claim, as my invention, all the several parts of the apparatus shewn in the accompanying drawing; but that which I do claim, is the method of supplying hot water for feeding the boiler of a steam-engine, either locomotive or stationary, by the means described of passing the water through tubes, constituting the fire-bars of the furnace.—[*Inrolled in the Rolls Chapel Office, Jan.* 1841.]

To William Thomas Yates, *of John-street, Cambridge Heath, in the county of Middlesex, engineer, for his invention of certain improvements in boilers for steam-engines and other uses.*—[Sealed 23rd January, 1834.]

The boiler proposed is to be of a cylindrical form, having tubular passages through it in various directions, as flues for carrying the heat of the furnace more effectually through the mass of water contained in the cylindrical vessel.

The tubes, constituting the flues, may be either circular or elliptical, and they may extend through the boiler from side to side, either in straight or diagonal directions, crossing each other in the centre or axis of the cylinder; or the flue-tubes may be bent in curves, entering at any part of the periphery of the cylinder, and passing out at the ends. The twofold object being, firstly,—to conduct the flame and heated vapour from the furnace into the midst of the water, in order that the steam may be more rapidly generated; and secondly,—to give tension and strength to the cylindrical vessel, and prevent its expansion by the internal pressure of the steam.

This cylindrical boiler is to be mounted in the furnace on pivots, at its ends, for the purpose of enabling it to be turned over, either by a rotary or reciprocating motion, in order to keep the water in a continual state of agitation, by which the heat may more effectually come into contact with it, and the steam be very rapidly produced.

This construction of boiler is also proposed to be employed for heating liquids for distillation, and other purposes.—[*Inrolled in the Petty Bag Office, July,* 1834.]

To Henry Crosley, *of Hooper-square, Lemon-street, in the city of London, engineer, for his invention of an improved method or process, arrangement, and combination of apparatus, with certain agents used or employed therewith, whereby evaporation of fluids and solutions may be effected advantageously; and also for other beneficial purposes to which the said method or process is applicable, or can be applied.*—[Sealed 8th April, 1834.]

It has been long known, that the evaporation of liquids (such, for instance, as molasses in the preparation of sugar) may be greatly facilitated by passing currents of air or steam through the liquid whilst under the operation of boiling.—This is an apparatus for effecting that object.

A wheel, of a diameter somewhat less than the interior of the boiler, is constructed; the box, spokes, and felloe of which, are made of thin metal, and hollow. This wheel is immersed, in a horizontal position, in the circular pan or open boiler, charged with molasses under the operation of boiling over a strong fire.

The wheel is so suspended in the boiler, that it may revolve upon its vertical axis, which is also hollow; and connected to this hollow axis is a revolving apparatus.

When the process is going on, the blowing apparatus forces a strong blast of wind through the hollow axis into the hollow wheel, from whence it escapes by a multitude of small openings or jets in the spokes and felloe of the wheel, and is thereby made to pass upwards through the boiling liquid, and to carry up with it, in the form of steam, very considerable portions of the aqueous vapour, so as greatly to facilitate the evaporation and concentration of the sugar.

This operation is also further promoted by giving to the wheel rotary motion, which may be done by a band from any first mover, passed round a pulley, fixed on the hollow axle; and, in order to prevent the adhesion of the sugar to the pan, wooden scrapers are to be fixed to the under part of each spoke of the wheel, which, as they revolve, will agitate the coagulated mass, and prevent its burning to the bottom of the pan.

The apparatus, it will be perceived, is not confined to the crystallization of sugar,—it may be applied in many other situations, where the rapid evaporation of liquid is required.—[*Inrolled in the Inrolment Office, October,* 1834.]

To Christopher Dain, *of Edgbaston, in the county of Warwick, gent., for certain improvements in the construction of vessels for containing and supplying ink and other fluids.*—[Sealed 2nd June, 1840.]

The vessel, for containing the ink, is formed nearly like an ordinary glass retort, used by experimental chemists; the bulbous part being intended to constitute the reservoir, and the small open end the nozzle, from whence the ink is to be taken, by dipping in the point of the pen. This glass vessel is fixed in an erect position, upon an oblong tablet as a base or stand, and is confined thereto by cement, and a bridle-piece clasping it near the middle of its neck. In this bridle-piece a vertical plunger is mounted, having a cork stopper at bottom, which passes into the glass vessel, and when at its lowest position, the cork stopper intercepts and prevents the ink from flowing from the reservoir to the nozzle.

The bulb has a small hole for the admission of air, which is covered by a spring stopper. This hole is opened when

the plunger is drawn up, for the purpose of allowing the ink to flow from the reservoir to the nozzle; and when it has reached the proper height in the nozzle, the hole is stopped by the spring stopper, to prevent the ink flowing over.

When the ink-stand is not in use, the ink is to be allowed to flow back into the reservoir, which it will do by removing the spring valve, and inclining the vessel. The plunger is then shut down, and the ink is enclosed air-tight, and thereby prevented from evaporating.

There are several complicated contrivances for working the spring valve and the stopper, but their offices may be readily conceived, and do not appear of sufficient importance to demand representation.—[*Inrolled in the Inrolment Office, December,* 1840.]

To THOMAS BARNABAS DAFT, *of Regent-street, gent., for certain improvements in ink-stands; and in materials and apparatus for fastening and sealing letters or other documents.*—[Sealed 2nd February, 1839.]

THIS improved ink-stand is a close air-tight vessel, of metal or glass, containing the ink; through the top of which an open tube is inserted, that reaches nearly to the bottom, having a mouth-piece above for the pen to be dipped into. A plug or plunger is also screwed into the top of the vessel, which, when removed, allows the ink to be poured in, and being then closed, secures it. The ink having being poured in occupies the lower part of this closed vessel, the upper part having, of course, a volume of atmospheric air confined within it. When the plug or plunger is screwed down into the vessel, the air within necessarily becomes compressed, and by its elastic force, acting upon the upper surface of

the ink within the vessel, forces the ink up the tube to the mouth or nozzle, whence it may be taken by the point of the pen. On raising the plug or plunger a little, the pressure of the air within is relieved, and the ink is prevented from flowing out from want of air-vent, even though the vessel were inverted.

The contrivance for securing a letter, is a small staple of thin plate metal, the ends of which are to be passed through the folded paper, and being thus bent down, the junctions are to be held together by sealing-wax.—[*Inrolled in the Inrolment Office, August*, 1839.]

To THOMAS BARNABAS DAFT, *of Birmingham, gent., for improvements in ink-stands, or ink-holders.*—[Sealed 1st August, 1840.]

THIS, like the above, is a close air-tight vessel, of glass or metal, which is to contain the ink, and a confined volume of atmospheric air within it. An open tube is inserted into the vessel, with a nozzle at top, from whence the ink is to be dipped. A plunger or piston works in a short tube, inserted into the top of the vessel; which plunger is, by a lever, connected to the cap or cover of the nozzle of the ink-tube.

When the cap or cover is raised from the nozzle, for the purpose of dipping into the ink-tube, the plunger descends into the vessel, and by compressing the air therein, causes it to force up the ink to the mouth or nozzle of the tube. When the cap or cover is shut down again, the pressure of the air being relieved, the ink descends in the tube, and is prevented from flowing out by want of air-vent.

A modification of this invention consists in attaching to the plunger or plug, and to the bottom of the tube in which

it works, a flexible diaphragm, which appears to be only a variation, designed to relieve the friction which would attend a tightly-packed air-tight piston.

Another modification of the invention, is forming the nozzle of the ink-stand in a sliding stopper, the descent of which, when pressed down, acts as before described upon the confined volume of air within.—[*Inrolled in the Inrolment Office, February,* 1841.]

To THOMAS JOHN FULLER, *of the Commercial-road, in the county of Middlesex, civil engineer, for his invention of an improvement in the shape or form of nails, spikes, and bolts.*—[Sealed 6th March, 1834.]

THIS invention is merely that which is stated above,—an improvement in the shape or form of the nail; viz. to make the sides of the nail hollow instead of flat, as usual.

No particular mode of producing this form of nail is claimed; but it is stated, that it may be done by swages, or any other convenient means.—[*Inrolled in the Petty Bag Office, September,* 1834.]

To MATTHEW BUSH, *of Dalmonarch, Printfield, near Bonhill, by Dumbarton, North Britain, calico printer, for his invention of certain improvements in machinery or appar tus for drying and printing calicoes and other fabrics.*—[Sealed 14th June, 1834.]

IF there is any thing useful in this invention, the manner in which the specification has been framed effectually prevents its merits being perceived. To attempt an epitome or recital of the leading features of a document like this, is totally out of our power. Beside a multitude of elabo-

rate drawings, the explanatory part of the specification is spread over fifty-two large sheets of closely-written parchment, recounting not only what the patentee proposes to do, but also what every body else has heretofore done, in reference to drying and printing calicoes; and this is further illumined by an innumerable collection of copious notes, referring to, or perhaps we should say, enlarging the subject. As far as we have been enabled to pick out any distinguishable objects in this specification, we will state them:—

Respecting printing fabrics in several colours at once, the colours are required to be rapidly dried; and for this purpose the fabric is to be extended evenly, and conducted through the machine with great exactness. The piece, therefore, is to be stretched in breadth by a transverse rod with pins, and the sides of the piece are kept out by longitudinal travelling bands, having pins; which bands run over pullies, placed slightly oblique, in order to draw the fabric to its required tension. In this way the fabric is, after being printed, conducted over a series of drying rollers, charged with steam, which sets the colours.

The printing is to be done in an ordinary machine or press, the colours being furnished from what is called the "toby tub." This toby tub is divided into compartments, forming cells of any required shapes, corresponding to the pattern, to receive the various colours, which are transferred at once from thence to the blocks, either by dipping them into the toby tub, or by rollers passed over it.

These cells are furnished with the colours by means of pipes leading from the several reservoirs, which respectively conduct it into the under parts of the cells, and the colours are kept at their proper levels in the cells by regulating their heights in the reservoirs.—[*Inrolled in the Inrolment Office, December,* 1834.]

To THOMAS MILNER, *of Liverpool, in the county of Lancaster, safety-box manufacturer, for his invention of certain improvements in boxes, safes, or other depositories, for the protection of paper, or other materials, from fire.*—[Sealed 26th February, 1840.]

THESE improvements in boxes, safes, or other depositories, for the protection of papers or other materials from fire, consist in constructing such boxes, safes, &c., of an outer case of iron or other metal, enclosing one, two, or more inner cases, with spaces or chambers between them, containing an absorbent material or composition, such as porous wood, dust of wood, dust of bones, or similar substances, in which are distributed vessels, pipes, or tubes, filled with an alkaline solution, or any other liquid or matter evolving steam or moisture; the tubes or vessels bursting or otherwise discharging themselves, on the exposure of the box or other depository to heat or fire, into the surrounding absorbent matter; which, thus pervaded with moisture, and rendered difficult of destruction, protects the inner cases or boxes and their contents.

This invention, the patentee describes to be equally applicable to all depositories or receptacles of property, in order to protect the same from fire; as for instance,—the linings of strong rooms, safes, and closets; and also for enclosures for alphabetical or other nests of partitions or chambers for depositing office papers, &c.; it may also be applied separately to book-bindings, such as their covers, backs, and edges; for ledgers, valuable manuscripts, or other books in libraries; which, thus protected, the exterior may fearlessly be submitted to a red heat without the slightest injury to the enclosed property. It is also equally applicable to lining secretaries, writing and travelling desks

or cases, portfolios, chests for laces, silks, or other valuable goods; plate and jewel boxes, &c.

The figure in Plate II., represents the box in vertical section. The outer casing of metal or other material, is represented at *a, a*, and the inner casing at *b, b*, enclosing any absorbent material or substance *c, c*; vessels, pipes, or tubes, filled with liquid, are shewn at *d, d*, which is the arrangement or distribution.

The patentee states,—"I do not claim the construction of a hollow chambered box or case, nor the interposition of a non-conducting material therein, as I am aware that such contrivances have hitherto been used to protect property from fire; but I claim, as my invention, the introduction or application of the combined effect in chambered boxes or depositories, of the moisture and material kept humid in the space surrounding the innermost box and its contents, without in any way being confined to the material or liquid employed, or the manner in which it may be distributed or arranged, in order to produce the desired effect of protecting boxes, safes, or other depositories, enclosing papers or other materials from fire.—[*Inrolled at the Petty Bag Office, August*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To George John Newbery, *of Cripplegate-buildings, in the city of London, manufacturer, for certain improvements in rendering silk, cotton, woollen, linen, and other fabrics, water-proof.*—[Sealed 12th May, 1840.]

These improvements in rendering silk, cotton, woollen, linen, and other fabrics water-proof, consist in the application of drying oils and oil compositions, varnishes, &c., for this purpose, in such a way, that one side of the fabric,

when finished, presents an appearance but little altered by the process of water-proofing.

To preserve the original appearance of the fabric on the one side, while the other shall be completely coated with the water-proof composition, has long been a desideratum. Various plans have been tried to accomplish this object, but they have invariably left stains on the face of the fabric; for if stiff colour is used and spread on one side, the more fluid portions of the mixture is withdrawn, and dries in stains on the other side of the textures, after the manner in which elain will leave the stearine on pressing fat suet between bibulous paper; and if the texture to be water-proofed is saturated with water, (which has been done in some instances,) then the oil, paint, or other compositions, cannot take a sufficiently firm hold of the side of the texture it is applied to, and is still apt to go through the fabric and show on the other side, caused by the pressure necessary to spread so thick a material as must be used; and the texture must be kept saturated with aqueous matter until the oily substance is dry; and when dried it is of but little use as a water-proof, and is easily rubbed off, not having sufficient hold of the fibre of the texture.

The improved method of water-proofing fabrics employed, which forms the subject of this invention, is saturating the texture completely with the composition intended to form the coating or water-proofing, and exposing one surface only, in such a way, to the action of the atmosphere or artificial heat, that it shall become coated with a dry membraneous stratum or pellicle of the composition, while the reverse side is protected from the action of the atmosphere or artificial heat. At this stage of the process, the moist or unhardened side of the texture may be washed and cleansed by means of spirits of turpentine or other suitable liquid, and then hung up to dry, and by evaporation lose

the odour of both the water-proofing and clearing medium.

There are several methods described by the patentee, whereby he effects the hardening of the water-proofing mixture on the one side, while on the other it is preserved in a moist state. One process is to use oil baths, (about a quarter or half an inch deep,) and allow the frame containing the strained silk or fabric to float thereon, the upper surface of the fabric being left exposed to the action of the atmosphere.

Another method of carrying these improvements into effect, is by merely laying the saturated fabric on a slab of slate or stone, or metal, or other surface, or material, non-absorbent to oils or such matters; and this the patentee considers a more simple and convenient method of effecting the objects desired.

The non-absorbent surfaces preferred, are tables made of wood, and coated with thin glue or varnish; and when the water-proofing process is to be performed, the table must (by a brush) be covered evenly with the oil composition, about as thick as a painter generally covers a wall or partition with oil paint.

The fabric, being previously coiled on a roller, is placed at one end of the table and unrolled, so that it shall cover evenly the table or surface, coated by the siccative or oil composition; and if the fabric is thin or of fine texture, as silk goods, it will be completely saturated with the composition already laid on the table. Should the fabric not lay evenly on the table or surface in all parts, by merely rolling it thereon, it must be pressed down by means of the hands of the workman, and the wrinkles and air bubbles smoothed out by drawing the palm of the hand over the fabric from the middle towards the sides, or by rollers or scrapers; and by this means the quantity of oil or siccative composition may be regulated.

The time required for drying or rather for obtaining the pellicle surface or thin coating or covering, depends on the nature of the oil compositions or water-proofing material employed. In summer temperature, the ordinary boiled linseed oil takes about ten hours; but this may be ascertained by touching the surface with the finger from time to time, the drying process being continued until the outer surface of the material used loses its tackness or adhesiveness, or, in other words, until the pellicle is properly obtained.

Another variation of the mode of carrying the improvement into effect, is by straining two pieces of fabric on a stretching frame, such as is commonly used by calico printers and cloth dressers, so that their surfaces are placed evenly and closely in contact, and then saturating them with the water-proofing material. By this method, the outer sides will become dry or hardened, whilst the inner surfaces will be left moist.

While the process of water-proofing is proceeding, damask or coating patterns may be obtained, if thought desirable; for, instead of having a plain table or surface of slate or of wood placed in contact with that side of the fabric which is to be protected from the drying action of the air or heat, the saturated silk or fabric may be spread upon a surface or table, (which has not previously had a coating of oil,) having a pattern formed upon it, such pattern being sufficiently counter-sunk or raised (say about the depth of one-eighth of an inch or more) after the manner of ordinary calico or paper-stainer's pattern blocks,—the raised parts of this pattern block or table being placed in close contact with one side of the saturated silk or fabric; that is, the one intended to have the pattern formed upon it, and the fabric stretched over it, the indented or sunken parts of the pattern not being filled with the composition, will allow

the water-proofing material to harden or become pellicled, while the raised parts will prevent such effect taking place, where in contact with the fabric.

The patentee claims the improved modes, methods, processes, or modifications, above described, of applying substances to saturated textures, so as to prevent one surface thereof from drying, hardening, or forming a pellicle thereon, while the other is allowed so to do by the action of the atmosphere or artificial heat to which it is exposed, evaporating a portion of the aqueous or volatile parts of the oils or compositions, and then afterwards clearing away the moist parts by the agency of spirits of turpentine or other suitable liquid; and also the mode, manner, or process of producing damask patterns or designs on the surface of such fabrics, in the way or manner above stated.—[*Inrolled at the Rolls Chapel Office, November,* 1840.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 419, Vol. XVIII.)

Feb. 16, 1841.

The PRESIDENT in the Chair.

"Practical Observations on the management of a Locomotive Engine."

By Charles Hutton Gregory, Grad. Inst. C. E.

The working of a railway involves a number of practical details with which it is of great importance that the young engineer should make himself thoroughly acquainted. Of these, one of the most important is the management of a locomotive engine.

The communication consists of practical remarks on this subject from the author's individual experience; it is divided into three sections:—1st. The management of an engine in the Station.—2d. On the Road. 3d. In cases of accident.

Section 1st—contains instructions as to the state in which an engine should be kept in the station, and a detailed account of the examination to which it should be subjected previously to its starting with a train. The principal working parts are mentioned, with the particular attention due to each; and the proper supplies of oil, coke, and water, enumerated. The section concludes with a list of the articles necessary to be carried on the tender.

Section 2d—enters fully into the leading points of engine-driving. After attending to the precautions to be taken in starting, the author points out the proper position of the engineman, and the attention which he should give to the state of the rails, the safety of the train, and the working of the engine. Instructions are then given for the production and maintenance of a sufficiency of steam, by the judicious management of *water* and *fuel*. The proper height of the water in the boiler is described both under general and particular circumstances, and the times at which it should be supplied: with observations on priming, on the action of the pumps, and their irregularities.

This is followed by remarks on the proper manner of supplying coke, the extent and periods of that supply, the proper height of the coke in the fire box, &c.

Instructions are given for economizing and rendering the steam most efficient; the mode of treatment to be adopted in cases of extraordinary deficiency or excess; rules for stopping and starting at the stations; general hints in case of the wheels slipping, and of the heating of the axles; precautionary measures to be adopted on curves, steep inclines, dangerous parts of the road, &c.; the care necessary for an engine at the end of each journey, and when finishing its work for the day.

Section 3d—describes those accidents to which engines are most liable when running, and the steps to be taken under the circumstances: viz.—The bursting of a tube, the lagging of the

boiler catching fire, the failing of the feed pumps, the breaking of an axle, of a spring, or of the connecting rod, the disconnexion of the piston, of the excentrics, or any of the slide valve gear, the fracture of the strap of the slide valve, and the engine running off the rails.

"Observations on the effect of wind on the suspension bridge over the Menai Strait, more especially with reference to the injuries which its roadways sustained during the storm of January 1839."

By W. A. Provis, M. Inst. C. E.

In the month of December 1825, when the original construction of the bridge was nearly completed, several severe gales occurred, and considerable motion was observed, both in the main chains and in the platform of the carriage ways. It appeared that the chains were not acted upon simultaneously, nor with equal intensity; it was believed, therefore, that if they were attached to each other, and retained in parallel planes, the total amount of movement would be diminished.

On the 30th of January, and on the 6th of February, 1826, some heavy gales again caused considerable motion of the chains and roadway, breaking several of the vertical suspending rods, and of the iron bearers of the platform.

These bearers were constructed of wrought-iron bars, overlapping each other, and bolted together, with the ends of the suspending rods between them, for the purpose of giving stiffness to the structure. The flooring planks were bolted to the bearers, and notched to fit closely round the suspending rods, which were thereby held almost immoveably in the platform.

It was observed, that the character of the motion of the platform was not that of simple undulation, as had been anticipated, but the movement of the undulatory wave was oblique, both with respect to the lines of the bearers, and to the general direction of the bridge. It appeared, that when the summit of the wave was at a given point on the windward side, it was not collateral with

it on the leeward side, but, in relation to the flow of the wave, considerably behind it, and forming a diagonal line of wave across the platform.

The tendency of this undulation was, therefore, to bend the bearers into a form produced by the oblique intersection of a vertical plane with the surface of the moving wave. The bearers were not calculated to resist a strain of this nature : they therefore were fractured generally through the eyes on each side of the centre foot-path, at the point of junction with the suspending rods, which being bent backwards and forwards where they were held fast at the surface of the roadway, were in many instances wrenched asunder also.

The means adopted for repairing these injuries, and for preventing the recurrence of them, were, placing a stirrup, with a broad sole, beneath each of the fractured bearers, attaching it by an eye to the suspending rod, cutting away the planking for an inch around the rods, and at the same time bolting, transversely, to the underside of the roadway, an oak plank, fifteen feet long, between each two bearers, for the purpose of giving to the platform a greater degree of stiffness, combined with elasticity, than it previously possessed. The four lines of main chains were also connected by wrought-iron bolts passing through the joint plates, and traversing hollow cast-iron distance pieces, placed horizontally between the chains.

The effects of these alterations were so beneficial, that little or no injury occurred for nearly ten years. On the 23d of January, 1836, a more than usually severe gale caused violent undulation of the platform, and broke several rods. There can be little doubt that ten years' constant friction, combined with the shrinking of the timber, had relaxed the stiffness of the platform, and permitted an increased degree of undulation. The gate-keeper described the extreme amount of rise and fall of the roadway in a heavy gale to be not less than sixteen feet; the greatest amount of motion being about half way between the pyramids and the centre of the bridge.

In consequence of the injuries sustained during this gale, the

author and Mr. Rhodes were instructed to give in a report upon the state of the bridge, and on any repairs or additions which might appear desirable.

The result of the examination was satisfactory; the whole of the masonry, the main chains, their attachments to the rock, the rollers and iron-work upon the pyramids, and all the principle parts of the bridge, were as perfect as when first constructed; it was, however, recommended, that "a greater degree of rigidity should be given to the roadways, so that they should not bend so easily under vertical pressure."

The bridge remained in the same state until the hurricane of the 6th and 7th of January, 1839; during the night of the 6th, all approach to the bridge was impracticable: the bridge-keeper, however, ascertained that the roadways were partially destroyed; and he in consequence traversed the strait in a boat in time to prevent the down mail from London driving on to the bridge.

When the day broke, it was found that the centre footpath alone remained entire, while both the carriage ways were fractured in several places. The suspending rods appeared to have suffered the greatest amount of injury; out of the total number of 444, rather more than one-third were torn asunder; one piece, 175 feet long, of the N.E. carriage way, was hanging down and flapping in the wind; much of the parapet railing was broken away; the ties and distance pieces between the main chains were destroyed; the chains had resisted well in spite of the violent oscillation they had been subjected to, to such an extent, as to beat them together and strike the heads off bolts of three inches diameter.

Means were immediately adopted for restoring the roadways; and so rapidly was this effected, that in five days carriages and horses passed over, while foot passengers were not at any time prevented from crossing.

The account of the restoration of the bridge, communicated by Mr. Maude to the Institution, is then alluded to.

The substance of the report of the author to the Commissioners of Her Majesty's Woods is then given, and a review of the proposals made by Mr. Comms, Colonel Pasley, and others, relative to the restoration.

The opinion of Colonel Pasley, "that all the injuries which have occurred to the roadways of Suspension Bridges must have been caused by the violent action of the wind from below," is then examined, and reasons given for the author's dissent from that opinion.

The action of the wind upon the Conway and Hammersmith Bridges, is next examined; and from the amount of oscillation observed in all suspension bridges, the conclusion is arrived at, that winds act strongly and prejudicially on the fronts as well as on the horizontal surfaces of the platforms of suspension bridges, and that the effect of winds is modified and varied by the nature of the country, and the local circumstances connected with each individual bridge. Although differing in opinion with Colonel Pasley as to the general cause of injury to suspension bridges, the author agrees with him in the propriety of giving increased longitudinal rigidity to their platforms, to prevent or to restrict undulation. He advised its adoption in 1836, and applied his plan of stiffening by beams, in 1839. He preferred beams to trussed framing, on account of the facility with which the former could be increased in number, to obtain any requisite degree of stiffness, and because he feared that trussed frames could not always be kept firmly in their true vertical positions.

A drawing showing the injuries sustained by the platform during the hurricane of 1839, accompanied the communication.

Mr. Cowper was of opinion, that the real cause of injury to suspension bridges was the vibration of the chains and roadway. The whole suspended part, when acted upon by the wind, became in some measure a pendulum, and if the gusts of wind were to recur at measured intervals, according either with the vibration of the pendulum, or with any multiples of it, such an amount of oscillation would ensue as must destroy the structure. He illustrated this proposition by a model with chains of different curves, and at the same time pointed out the efficiency of slight brace chains in checking the vibration.

Mr. Brunel agreed with Mr. Cowper in his opinion of the cause of injury to bridges, and with the propriety of applying brace chains, for preventing the vibration. He then alluded to the introduction of lateral braces in the bridge designed by Mr. Brunel, Sen. for the Isle of Bourbon. He had been at the Menai Bridge during a severe storm, and had particularly noticed the vibration of the chains, with the accompanying undulation of the platform. The force of the wind was not apparently from beneath; it appeared to act altogether laterally. The chains were too high above the roadway; their vibration commenced before the platform moved; the unequal lengths of the suspension rods then caused the undulating motion. His attention had latterly been much given to the subject on account of the Clifton Suspension Bridge, now erecting under his direction. The span would be seven hundred feet, and the height above the water about two hundred feet. He intended to apply the system of brace chains at a small angle to check vibration. To two fixed points in the face of one pyramid would be attached two chains, each describing a curve horizontally beneath the platform, touching respectively the opposite sides of the centre of the bridge, and thence extending to similar points on the other pyramid: there they were attached to two levers, the ends of which were connected with a counter-balance of about four tons weight appended to each; these weights would hold the chains sufficiently extended to enable them to resist the lateral action of the strongest winds without their being so rigid as to endanger any part of the structure. By this contrivance the platform would be kept firm, which was the chief point to be attained.

In all suspension bridges the roadways had been made too flexible, and the slightest force was sufficient to cause vibration and undulation. The platform of the Clifton Bridge would have beneath it a complete system of trough-shaped triangular bracing, which would render it quite stiff. He was an advocate for bringing the main chains down to the platform, as at the Hammersmith Bridge, and for attaching the bearers to the chains at two points only; when they were suspended by four rods, it not

unfrequently happened that the whole weight of a passing load was thrown upon the centre suspension rods, and the extremities of the bearers were lifted up and relieved from all pressure. The extent of the expansion and contraction of the chains was a point of importance. In the Menai Bridge the main chains on a summer day would be as much as sixteen inches longer than in a winter's night. At the Clifton Bridge the difference under similar circumstances would be about twenty inches. The whole expansion of the back chain beyond the pyramids must be thrown into the suspended part. He would prefer having only one chain on each side of the bridge, and that chain much stronger than is usually adopted, but in deference to public opinion he had put two; he believed that they rarely expanded equally, and hence an unequal distribution of the weight of the roadways upon the suspension rods occurred. A rigid platform would in some degree prevent this, but he had endeavoured to lessen the effects of unequal expansion by arranging a stirrup at the top of each suspending rod, so as to hold equally at all times upon both the chains, and thus cause each to sustain its proportion of the load.

Mr. Seaward had never seen the force of wind exerted at regular intervals, as Mr. Cowper had supposed; if the gusts were repeated at such intervals, no suspension bridge, nor any elevated shaft or chimney in masonry, could resist them.

Mr. Rendel believed that the errors committed in the construction of suspension bridges had principally arisen from engineers theorizing too much on the properties of the catenary curve, without attending sufficiently to the practical effects of wind in the peculiar localities in which the bridges were placed. He could not agree with Mr. Cowper in his view of the intermittent action of the wind, or the vibrating of the chains. Observation had led him to conclude that, in the positions in which suspension bridges were usually placed, the action of the wind was not uniform; for instance, it would act at the same moment on the upper side of one end of the roadway, and on the lower side at the other end. In this case, unless the platform

possessed a certain degree of rigidity, undulation was induced and oscillation ensued. Braces and stays would not counteract this—nothing but a construction of platform, which made it in itself rigid by some mode of trussing, could withstand this kind of action. He agreed with Mr. Brunel in his idea of reducing the number of the suspending chains. At the Montrose Bridge, which was 432 feet span, he had endeavoured to avoid all complexity of contrivances by adopting a complete system of vertical diagonal trussing, which was ten feet deep—five feet above, and five feet below the platform—so as to insure rigidity, and to produce that solidity which was essential for preventing undulation and oscillation.

Mr. Cowper reverted to the motion which he had found to be so easily produced by repeatedly exerting a small force at measured intervals against the main chains of the Hammersmith Bridge. He conceived that if the chain oscillated, the roadway must oscillate also.

Mr. Rendel contended that the motion produced by the impulses, communicated by Mr. Cowper, to the chain, resolved itself into undulation, and not oscillation. He could not understand the advantages of the trussing adopted at the Hammersmith Bridge; it appeared to him that its tendency was, on the passage of a heavy weight, to relieve four out of five of the suspending rods from their due proportion of the load, and to throw it upon the fifth rod. His object in the construction of the framing of such platforms had always been to spread the load quite equally, and rendering it rigid by means of vertical trussed framing, to prevent the undulation which was the primary cause of oscillation. He would distinguish clearly between the two motions, and say, that undulation was motion in the direct line of the platform, and that oscillation was a motion at right angles with it. Vibration was identical with undulatory action.

Mr. Donkin conceived that a good system of trussed framing could alone prevent undulation or oscillation; if the framing were placed vertically, its tendency would be to prevent undulation; if placed horizontally, to prevent oscillation: now, as

Mr. Rendel had given it as his opinion, that the latter action resulted from the former, the system of trussing adopted by him at the Montrose Bridge, would appear calculated to obtain the desired end. A slight exertion of force would produce a perceptible undulation, and a certain degree of vibration would result from the natural elasticity of the materials.

Mr. Seaward remarked, that the degree of oscillation would appear to depend in some measure upon the distance at which the platform was suspended beneath the chains, and upon the distance between the points of suspension of the main chains; if the platform was rigidly held at the extremities, the motion would be vibratory, and not amounting to undulation.

Original Communication.

ON THE ENGINEERING OF THE ANCIENT EGYPTIANS.

BY J. S. PERRING, ESQ.

No. III.

The two former papers have treated more particularly of the Hydraulic Engineering of the Egyptians; and in this branch of the varied practice of engineering they attained great proficiency. They were close and careful observers of nature; and hydraulic engineering derives all its information from, and depends for its success, solely on natural operations. The peculiar features of the country also, as before observed, made its study of first-rate national importance.

The observation, that in a river, whose waters are charged with earthy particles, the effect of a few stones or other impediment breaking the force of the stream, and causing an eddy or still water behind, was to cause the accumulation of soil by deposit, may be supposed to have led to the formation of jetties or breakwaters at certain distances along the river throughout Nubia, where the space in the valley was confined. By these the limited soil, on the banks of the stream, was increased; and, when so increased, protected from the scour of the current.

These jetties are still remaining, and serve the same purpose; and an engineer, on contemplating their utility, may be cheered with the idea, that some of his own works may perchance, after the lapse of forty centuries, continue to serve the same benificent purpose for which they were formed. Between these jetties the water always flows in the same channel, and they also serve to form a shelter for the small vessels of the country.

The number of natural harbours on the coast of the Red Sea, and the small amount of Egyptian trade on the Mediterranean, made the formation of artificial harbours on the coast unnecessary.

The mechanical skill of the Ancient Egyptians is shewn by the ease with which they managed large masses of stone, and placed them either upright as obelisks, or raised them to great heights for the architraves and roof-blocks of their temples. Indeed, much of the peculiar character of their monuments may be ascribed to this skill, and made the use of the arch unnecessary. Though the arch seems to have been in common use among them, for ordinary buildings, it would appear that they considered it merely as an expedient, and aware of its self-destroying properties, preferred covering spaces by single blocks of stone.

The invention of the arch has been a subject of much discussion; some authors, tracing all our knowledge from the Greeks, have ascribed to them the honor of the invention; but it does not occur in any of their buildings previous to Alexander. But, as the Greek connection with Egypt commenced at that period, there seems to us but little doubt but that they borrowed the idea from thence.

A slight outline of the history of the arch, as derived from Egyptian monuments, will not be uninteresting. The sculptures on the walls of the tombs of Beni Hassan, executed in the reign of Osirtesen I., (about the era of Joseph,) afford ample proof that the arch was used in the construction of their granaries and houses, and that its invention had been perfected. But this must have taken place between the building of the pyramids and this era, for we have negative proof, that at the early period of the erection of these monuments, they were not acquainted with its use. For though at no period do they seem to have used the arch in situations where its own pressure might have the effect of thrusting out and destroying its abutments,—that is, in any erections,—yet there are many places in the pyramids, where either the mass was sufficient to prevent any fear of such result, or where the springing might have been from the solid rock. But, in their edifices, they resorted to other methods whenever it was necessary to cover a space; thus,—the principal apartment of the Great Pyramid of Ghizet is covered with large flat blocks of granite; but where great strength was required, they

either covered the space with inclined blocks of stone of great magnitude, meeting in the centre and forming pointed roofs, or each course of stones, above a certain height, was made to project 3 or 4 inches over the one below it, until the opposite sides nearly met, and were then covered by flat blocks; but in no instance do we see any thing involving the principle of the arch.

Thus we may fairly conclude, that when the pyramids were erected, the arch was unknown; but it seems to have been in common use in the reign of Osirtesen, and therefore, the invention must have been made and perfected betwen 2100 and 1700 B.C.; but, as there are no buildings now met with in Egypt of the intermediate period, we are unable to trace the progress of this important invention.

After that, we meet with several instances of it:—the roof of a tomb at Thebes, discovered by Sir Gardner Wilkinson, is formed, like many others near it, of crude bricks, built as a regular arch, and bears the name of Ammeoph I., who reigned about 1540 years before our era; and near the Mennorium are many arches of the same material, evidently belonging to the reign of the great Sesostris, or 1350 B.C. But the oldest stone arch in existence, whose age is positively known, is but little older than Tirhaka, about 700 B.C., and is in the portico of one of the pyramids of Meroe. In all their edifices of stone, in Egypt, (being the temples of their gods, and built for eternal duration,) the Egyptians seem to have carefully avoided the arch, as aware that it carried with it the elements of its own destruction.

The chief object of an Egyptian architect was stability; hence all weights and pressure were vertical; and though the sides of the walls were often inclined, the beds of the stones composing them were always horizontal; and so careful were they to avoid any chance of rupture, that the architrave was not allowed, in columnar buildings, to press immediately on the capital of a column, but an intermediate member was introduced, of a cubical shape, but often decorated, which being immediately over the centre of the column, was supported by it, and carried the superincumbent weight clear of the ornamental portion of the column.

Using large blocks and keeping the pressure vertical, the Egyptians did not consider it necessary to use any strong adhesive cement; hence they paid but little attention to the composition of their mortars, but generally bound together the stones of a course with cramps or dogs of bronze or wood.

There is an impression, that Egyptian architecture is grotesque, and delights in odd forms and combinations;—this is at variance with the truth; its grand features are severity of form and simplicity of shape, more or less removed from but always allied to its original type, the pyramid; and its ornaments directly imitated

from natural productions around it. Thus it is essentially grand and imposing, more from simplicity than real magnitude. It carries with it an air of repose, arising from the absence of any finely proportioned part or balance of pressure that was necessary to sustain the edifice; but, as Gare observes, to form a proper judgment, we ought to view the monuments of Egypt in connection with the scale of the country. We ought to see them surrounded by these immense deserts, which presenting no character but monotony and extent, still possess that of grandeur. In the midst of such localities, it was necessary that the effect of the monuments should be in harmony with them;—all subdivisons would have appeared mean. These columns of an enormous diameter, those door-ways beyond all usual size, and the lofty propyla, are perfectly in unison with the places which surround them.

The conveyance of an obelisk from the quarry, and still more arduous task of raising it on its pedestal, were no doubt celebrated with pomp and ceremony; and yet it is singular that we do not find any sculptures illustrative of the methods whereby they were effected.

Obelisks were always of single stones, from the granite quarries of Essouan; the distance from Thebes, where they abounded, being 138 miles, and from Heliopolis 800; but, as Sir Gardner Wilkinson remarks, "the power to move the mass was the same, whatever might be the distance; and the mechanical skill which transported it five, or even one, would suffice for any number of miles."

One of these monuments, weighing about 246 tons, has been removed from Thebes, by a celebrated and scientific French engineer, M. Lebas, and re-erected in Paris. His very ingenious method of lowering and raising it, is above all praise, but requires illustration to explain it properly.* But it is singular, that upon some sculptures on the neighbouring temple of Karnack, where the Egyptian Army are represented as engaged in clearing a passage through a forest, they are lowering the large trees in precisely the same manner; and it may therefore be concluded that they extended the application of this very simple and efficient principle to the raising of their obelisks.

From a passage in Pliny,† it would appear that these immense masses were transported to their destination by water,—as he speaks of an obelisk having been moved in the following manner:—"A canal was dug from the river to the place where the obelisk lay, and two boats were placed side by side, and filled with pieces of stone, of the same material as the obelisk. These

* Vide M. Lebas's Memoir on the subject.

† Pliny Bk. 36, c. 9.

pieces were in the shape of a brick, and a foot in length, so that the proportion between the quantity of matter in the obelisk and that held by the boats, could be determined. The two boats were loaded to twice the weight of the obelisk, in order that they might go under it, its two ends resting on the two sides of the canal. Then, as the pieces of stone were taken out, the boats of course rose together, and at last supported the obelisk, and carried it off."

Herodotus* also mentions a Monolith, brought from Elephantine to Sais by boatmen, and therefore, his account confirms that of Pliny, that these huge masses were conveyed by water.

It would be out of place here to particularize each Monolith of which history makes mention; the one above alluded to by Herodotus, is said by him to have occupied 2000 men for three years; but as it appears to have been conveyed by water, it is probable that they were not the whole of that period engaged in the task, but rather that it occupied them during three seasons of three successive years, while the water was high enough to float the enormous mass.

Herodotus also informs us, that in moving it near the temple, it was managed by levers; but we do not glean, to a certainty, from his account, whether it was canted over or conveyed on a sledge, though the former would appear to have been the method used, as he speaks of a man having been crushed beneath it. In modern India, stones are often moved by being made up with timber, or formed of a cylindrical shape, and then rolled over to their destination; and, by the form of some masses near Heliopolis, it seems likely that the same method was sometimes used by the Egyptians.

But the most usual method, when the stone had received its shape, was by sledge, drawn by oxen when the mass was small, and by men when of a large size; and it would appear that great bodies of men were thus employed. In a grotto, discovered by the Baron Minuitoli, near El Bersheh, is a representation of a colossus on a sledge, which a number of men are employed in dragging with ropes. Judging by the proportion of the statue to the objects around, it appears to have weighed about 120 tons, and the number of men shewn dragging the sledge are 172, an insufficient force; but it is probable that the artist had no intention of representing a determinate number, or, for the sake of effect, he may have increased the dimensions of the colossus. The sledge is straight below, but curved up a little in front; and to this part are attached four ropes, at which the men are drawing, and a person standing on the front of the sledge pours on the ground or platform, whereon the sledge is

* Vide Bk. II. 175.

sliding, some liquid out of a vase, in order to lubricate the surface. The statue is fastened to the sledge by double ropes, between which is inserted short sticks, that serve, by twisting, (as in what is termed a Spanish windlass,) to bind the statue down to the sledge. To prevent injury, some layers of a soft substance are placed between the rope and the angles of the figure. On the knee of the figure stands a man, occupied in clapping his hands, and probably singing, as is now the custom in Egypt and India, to mark time and ensure simultaneous draught.

The largest statue existing at present in Egypt, is laying broken within the court of the Memnonium, being calculated, by Wilkinson "at 887 tons, brought from Essouan to Thebes, a distance, as before stated, of 138 miles."

But, still larger masses are described by Herodotus,* as forming the oracular shrine of the temple of Latona, in Butos, which was composed of five stones, the upper one or roof-block measuring about 70 feet square by 7 feet thick, and weighing at least 1400 tons.

Stones weighing more than 100 tons, are placed as roof-blocks in some of the pyramids, and others of equal size, as lintels or architraves for the larger temples; but how these were placed we cannot at present learn, as the examination of the edifices themselves does not assist our enquiries.

These blocks were placed with great accuracy, and from their frequent occurrence, it does not appear that they experienced the slightest difficulty; and though we should not in the present day, (were it necessary to use them,) yet it must be recollected that it is mechanical science, that of all others, has received improvement; and, beyond the knowledge of three, the simple mechanical powers, we are not aware that they ever made progress. And one modern invention alone,—the steam-engine, enables us to place the power of a 1000 men within a space that would not allow of 20 to exert their strength. But these considerations only serve to increase our admiration of the industry and power of a people who, of all others, merit the appellation of extraordinary.

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* Herod. Bk. II. 155.

Scientific Adjudication.

VICE CHANCELLOR'S COURT,

JULY 22ND, 1841,

BEFORE SIR LANCELOT SHADWELL, VICE CHANCELLOR.

MARLING *v* KIRBY.

This was an application for an injunction to prevent the defendants using an invention, alleged to have been patented* in May, 1824, by Lemuel Welman Wright, under the title "of certain constructions and improvements in machinery for making pins;" and which grant was further extended in August, 1837, by order of the Privy Council, for a term of five years, after the expiring of the original patent right.

†The counsel for the plaintiffs were Mr. WIGRAM, Mr. SHARPE, and Mr. BORRETT; for the defendants,—Mr. BRUCE, Mr. PIGGOTT, and Mr. BACON.

The plaintiffs, who are the assignees under the bankruptcy of Mr. Shuttleworth, the late proprietor of the invention, have continued to carry on the manufacture of the "solid-headed pins," at the works at Stroud, for the benefit of the creditors.

The defendants, Messrs. Kirby and Beard, who are large pin manufacturers at Gloucester, in October last advertised in the public papers that they would, in the January following, produce what they called "*Ne plus ultra* solid-headed pins." This the plaintiffs considered could only be done by an infringement on their own patent right; and so they represented it to the defendants, requesting an inspection of the machinery, which the latter refused.

A large number of affidavits were filed in support of the motion, which were met by counter affidavits on the part of the de-

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* For Specification of this Patent, see Vol. IX. p. 281, of our First Series.

† This must, doubtless, excite some interest, as it is the first Action for Infringement on a Renewed Patent.

fendants. The principal one lodged by the plaintiffs was by Sir Mark Brunel, which went into an explanation of those parts of the machinery alleged to have been infringed, and expressed an opinion in favour of the novelty of Wright's invention, on which he considered the defendants' machinery to be an infringement.

On the other side the purport of the affidavits went not only to deny the infringement, but questioned the validity of the invention. Mr. Farey, in his evidence, expressed a strong opinion that Wright's patent contained nothing more than had been open to all the world since the use of the patent inventions of Hunt, Bradbury, and Weaver.* The machinery of the defendants was, moreover, sworn to be an improvement on those inventions, and neither to have been derived from any thing discovered in Wright's patent, nor in Mr. Farey's opinion pirated from it.

The Vice Chancellor delivered the judgment in these words:—

This is a very singular case in many respects, because it strikes me, that if the position which the plaintiffs lay down is true, that in no manner whatever could solid-headed pins be made, except by the use of a machine which should be the plaintiffs', or an infringement of the plaintiffs' patent; it is, therefore, very singular that the plaintiffs did not more early apply to this Court for an injunction. For, if that position were true, as soon as the notification was made in the *The Times* newspaper of October last year, that, by the 1st of January, the defendants would produce their "ne plus ultra solid-headed pins," the plaintiffs had notice of all that would constitute their case, if that be true.

I also observe, that it seems to be represented by the affidavit, and certainly insisted on in the argument, that the mere production of the pins themselves, which had been purchased from the defendants, is a proof that the pins were made either by the plaintiffs' machine, or by a machine which was an infringement of the plaintiffs' patent. Some of those pins were purchased on

* We think it hardly likely that the Privy Council would have granted an extension of the Patent, especially in the face of the strenuous opposition which the applicants met with, had there not been something really novel and ingenious in the invention.—Ed.

the 27th of January, and some on the 11th of March; and if the attention of the plaintiffs had been called so early as the month of October to the fact, that such things would be produced, why, it is a very singular thing, that the plaintiffs hesitated so long as they did before they actually filed their bill, which they did not file, I think, until the month of May in this present year.

The application is made for an injunction to restrain the defendants from doing that which is said to be an infringement of the plaintiffs' patent.

Now the plaintiffs' patent was taken out in the words of the patent—the substantial words—"for the invention of certain combinations of, and improvements in machinery for making pins."

Now my notion is, that by mere words alone, but certainly by words coupled with diagrams, any one thought that entered into the mind of man may be completely and accurately described, so described as not merely to be understood, but so as to be incapable of being misunderstood.

Well, now the patent has certainly been in use for several years, and *prima facie* I take the patent to be good. I am not going to give any opinion on this, whether the patent is good or bad, but I must say this, that it struck me very much, on reading the specification through from beginning to end, or, at least, that sworn copy of it which was handed to me, that I could not make out what are the things in the successive parts, as they are represented, which constitute the invention of combinations of machinery and improvements in it, or which represent the invention of combinations, or the invention of the improvements conjunctively or disjunctively. I could not make out, from reading the specification, what it was exactly for which the patent was taken out; the patent, apparently, is represented for every thing that is described.

Well, then, I find this, that the mere words of the specification do of themselves not describe the thing which has been so forcibly and so clearly described to me in words by Mr. Wigram: that he alone has proved what I say, namely, that if the plaintiffs had had that clear conception of the case, which they might have

thought it worth while to develope on the specification, he might have done it just as well, and as clearly, and as utterly free from indistinctness as Mr. Wigram has done; but I look in vain in the specification for the clearness of Mr. Wigram's speech.

Well, then, it is said, that whatever is defective in the language of the specification is to be considered as cured by the diagrams.

Now, with reference to the diagrams, here we have such eminent gentlemen as Sir Mark Brunel and Mr. Farey, differing *toto cælo* as to the effect of these diagrams; and to my eye, which is unlearned, it certainly does not appear those diagrams do of necessity represent that which Sir Mark Brunel says is represented, and would be comprehended by any common workman who had to labour on the specification. I can easily understand, that when a workman is set to make a machine, according to the specification and diagrams, he might find a little verbal explanation somewhat auxiliary to him in the fabrication of the intended machine. However there the patent is, with this sort of objection apparently to it, that is to its effect. I am not saying the patent is bad by this; but the question is as between the plaintiffs and defendants, whether the plaintiffs' invention of combination and improvements in the machine in this particular respect, which is made the subject of the motion, has been so clearly expressed upon the specification as that this Court ought to interfere, by way of injunction, upon an alleged infringement of the patent. Well then, what is the true effect of the description in the specification? Taking the specification to include the drawings as part of it, it is, properly speaking, a question for a court of law, not for this Court to determine; and it may be that the patent has been used without interruption for twenty-four years—seventeen years, and this objection never have been thought of. I admit the continuance of the patent *per se* is *prima facie* evidence of its goodness, and, therefore, I shall say no more upon that subject.

Then observe how the case stands:—There had been a patent taken out by Bradbury in 1812; there was a patent taken out by Hunt in 1817. Both of those patents have expired, but the defendants became interested in Hunt's patent.

Well, Mr. Wright, as it appears by Mr. Kirby's affidavit, was under a contract some years ago to assist Mr. Kirby in his then operation, and in particular, as I understand the agreement, there were two covenants represented in Mr. Kirby's affidavit—he was under a contract to assist in making improvements on the machine. Now, what precise improvements he made, and what he said and did exactly during that time does not appear; but, whatever he said or did, which would tend to improve the machine, of course Mr. Kirby would have a right to avail himself of at any time.

Well then, Mr. Wright, after having left Mr. Kirby's service, takes out his patent in 1824. In October the attention of the plaintiffs is called to the advertisement which I have just now mentioned; upon which a letter, of the 9th of November, was written to Mr. Kirby, which produced Mr. Kirby's answer in effect, as I understand it, denying every thing imputed to him in the letter of the 9th, and then nothing appears to be done; but, on the 31st of December, I think, the notice was given which is stated in the affidavit.

The plaintiffs do not file the bill, although, as I understand their argument, they had, in their own conception, quite case enough for a bill, but they proceed to go about by means of the agents and purchase pins, which shall furnish more sufficient evidence of their case; and, upon the 27th of January, according to the affidavit of Mr. Flick and Mr. Briggs, a parcel of pins were purchased at White Greenwell's and Company; then, on the 11th of March, another parcel of pins was purchased, made by Kirby, of Williams and Sowerby.

It appears the consent of the creditors was not given before the 9th of March, and then, from that time until the middle of May, the plaintiffs wait before they file the bill.

Then, very properly, they gave notice—that was quite right—and then upon that there comes the usual war of affidavits.

Now, I have adverted to the circumstance, how Mr. Farey and Sir Mark Brunel differ as to the real effect of the specification and drawings; but there is this very remarkable passage

in Mr. Farey's affidavit, which appears to me to be extremely strong; he says that, having carefully examined the machinery used by the defendants, at Gloucester, for making solid-headed pins, and having compared the same with the various machinery described in the several specifications hereinbefore mentioned, he is of opinion that the defendants do not infringe in any manner upon Wright's patent aforesaid. The machine, whereby the defendants make solid-headed pins, is compounded of the apparatus described in Bradbury and Weaver's specification, "for supplying pin-shafts in regular succession to the die,"—that is one thing; and of the dies employed in Hunt's specification, which dies the plaintiffs use for forming the solid heads roughly,—that is the second thing; and for finishing the heads, after they were so roughly formed, the defendants use dies described in Bradbury and Weaver's specification.

Now here is then the deliberate opinion of Mr. Farey upon the fact propounded by the plaintiffs, and then, besides stating in his deliberate opinion what the defendants are doing is not an infringement, he states specifically the sort of combinations of machinery by means of which the defendants' pins are produced.

How can I, upon this case, say, here is a case so clear that the Court ought to interfere, when I find that, notwithstanding the confident opinion expressed by the plaintiffs upon the fact, that no solid-headed pins could be produced except by use of their machinery; and that the pins which are sold by Kirby of themselves do indicate decisively the fact, that they are made by means of an infringement of their own patent, they yet have acted in the way they have done in respect of the mode of applying to the Court.

Now it appears to me, therefore, upon these circumstances, I ought not to interfere in the way the plaintiffs seek.

The plaintiffs may have the legal right which they assert, and I do not deny it. I may have a doubt upon it, but it appears to me that the proper way for me to proceed is this,—at present not to make any other order on the motion but this, that the plaintiffs shall have liberty to proceed at law by such action as

they may be advised; and the motion must stand over until I either know the result of the action, or know that the plaintiffs wont try the action. I must reserve the further consideration of the motion and the costs until I know what the plaintiffs either will do, or what they will obtain by doing, and give liberty to apply; and it seems to me that at present there is no case made by means of which I ought to make any order, giving the plaintiffs a right to inspect any part of the defendants' machinery. The plaintiffs put their case so confidently forward, that, according to them, it is not necessary that the machinery should be inspected, because the mere production of that which is produced from the machinery is, according to them, a sufficient proof that their patent has been infringed; and, therefore, all I can do is at present to make that order.

List of Patents

Granted by the French Government from the 1st of July to the 30th of September, 1840.

PATENTS FOR FIFTEEN YEARS.

To William Church, of Birmingham, represented in Paris by M. Perpigna, advocate, of the French and Foreign Office for Patents, rue de Choiseul, No. 2, ter: for improvements in the manufacturing of buckles and hooks.

Davies, of Manchester, represented in Paris by M. Perpigna, advocate, for the revivification of animal charcoal.

Dembinski, represented in Paris by M. Perpigna, advocate, for giving the direction to balloons.

Edge, of London, represented in Paris by M. Perpigna, advocate, for an improved gas meter.

Fabre, represented in Paris by M. Perpigna, advocate, for the filtration of oils.

Hunt, of Birmingham, represented in Paris by M. Perpigna, advocate, for the manufacturing of soda, and producing sulphate of soda.

Laederich and Mallat, represented in Paris by M. Perpigna, advocate, for improvements in clock-works.

Smith, of Birmingham, represented in Paris by M. Perpigna, advocate, for an improved lamp and gas burner.

Balard,ef Montpellier, represented in Paris by M. Perpigna, advocate, for extracting salts of potash from sea water.

Barraud, Sen., represented in Paris by M. Perpigna, advocate, for the preparation of horse-hair and hogs' bristles.

Bernard, Jun., represented in Paris by M. Perpigna, advocate, for the manufacturing of mother-o'-pearl.

Boilley, represented in Paris by M. Perpigna, advocate, for the manufacturing of Prussian blue.

Comitti, of Duren, (Prussia) represented in Paris by M. Perpigna, advocate, for the manufacturing of wire cords.

Andraud and Tessié, du Motay, of Paris, for an hydraulic wheel.

Baudrimont, of Paris, for a new kind of road, to be substituted for rail-roads.

Bauerkeller and Co., of Paris, for geographical cards.

The Chevalier de Beaubois, of Paris, for the manufacturing of pin nails.

Bernhard, of Paris, for the manufacturing of beet-root sugar.

Boissard and Goupillat, of Paris, for the manufacturing of hydrochloric acid.

Boquillon, of Paris, for improvements in the production of electrotype plates.

Braud, of Batignolles, for the distilling of sea water.

Brosson, of Paris, for the manufacturing of sulphuric acid.

Canning, of Paris, for the purifying of tallow and oil.

Chaussenot, Sen., of Paris, for a new pump.

Chavepeyre and Pichon, of Paris, for a new method of heating combs used for the combing of wool.

Chevalier, of Paris, for a portable stove.

Clary, Forest, and Co., of Paris, for a rotatory steam-engine.

Cockerill, of St. Denis, for improvements in the combing of wool.

Collier, (Madame,) of Paris, for an improved machine for combing wool.

Convers and Boudsot, of Besançon, for an improved turbine.

Courbeau and Courvoisier, of Paris, for an improved steam waggon.

Delhomme, of Paris, for a press for copper-plate printing.

Delpierre, of Réthel, for the manufacturing and baking of bricks and lime.

Desorgues, of Paris, for paper manufactured from a new substance.

Durand, (Madame,) of Paris, for water-proof paint.

Duchan, of Paris, for a tincture of indigo blue.

Ermen, of Manchester, for a spinning machine.

Fery and De Beaurepaire, of Paris, for the purification of gas for illumination.

George, of Paris, for an improved weighing machine.

Gibus, of Paris, for a new method of making cocked hats.

Guiraud and Picard, of Paris, for a new loom.

Japy Brothers, of Paris, and Dumery, of Grenelle, for a new turbine.

Jean, of Paris, for a new kind of manure.

Krafft and Boissié Sucques, of Paris, for a new process of disinfection.

Labbé, of Paris, for a locomotive fire-engine.

Laffitte, of Paris, for a stove or furnace for steam generators.

Laurens and Thomas, of Paris, for the carbonisation of combustible matters.

Lebrun, of St. Sulpice, for an oven for baking bricks.

Loyer, of Paris, for a new method of employing night soil.

Maître, of Châtillon, for a double ventilator.

Mariott, of Valenciennes, for the reduction of ores in blast furnaces.

Martin and Badin, of Lyons, for the preparing of *alga tinctoria*.

Mathieu, of Paris, for a new fire-arm.

Mathieu, of Paris, for a machine for making nails.

Mawe, of London, for the spinning of certain fibrous matters.

Melressard, of Paris, for improved shutters for shops.

Merle, of Paris, for a new system of navigation.

Millet, of Paris, for a new method of introducing in vegetable substances antiseptic snbstances.

Morand, of Manchester, for a machine for stretching fabrics.

Muller, of Brest, for a new method of tightening the shrouds of ships.

Muschamp Sowerby, of Whitby, (England,) for an improved stuffing for steam engines.

Outrequin, Sen., of Paris, for knitting frames.

Ouvrard, of Paris, for an impermeable lamp.

Ouvrard, of Paris, for bituminous bricks.

Pecqueur, of Paris, for a frame for making fishing nets.

Perrot, of Rouen, for a new method of engraving cylinders used in printing of tissues.

Petit, of Paris, for a new ventilator for houses.

Quinet, of Paris, for a typographic impression of music.

Rottier and Guibal, of Paris, for an air engine.

Remond, of Orléans, for electro-magnetic motive power.

Rennie, of London, for improved paddle wheels.

Rommelaere, of Gand, for manufacturing alum.

Roth, of Paris, for a calculating machine.

Rougé, of Belleville, for bleaching of linen and woollen cloths.

Shuttleworth, of Sheffield, for new means of obtaining a rotary motion from the rectilinear motion of steam-engines.

Simyan, of Bordeaux, for a machine for cutting staves.

Sterlingue and Co., of Paris, for manufacturing leather for saddles.

Taconnet, of Paris, for improvements in tents.

Touchard, of Paris, for carriages warranted not to upset.

Trewhitt, of Paris, for a new pump.

Volasse and Brillant, of Châteauroux, for improved fire-arms

Valery & Lacroix, Jun., of Rouen, for a machine for fulling cloth.

Vouillon, of London, for a machine for making cloth.

List of Patents

That have passed the Great Seal of IRELAND, from the 18th June to the 17th of July, 1841, inclusive.

To James Ransome and Charles May, of Ipswich, in the county of Suffolk, machine-makers, for improvements in the manufacture of rail-way chairs, rail-way or other pins or bolts, and in wood fastenings and trenails.—Sealed 10th July.

William Petrie, of Croydon, in the county of Surrey, gent., for a mode of obtaining a moving power by means of voltaic electricity, applicable to engines and other cases where a moving power is required.—Sealed 10th July.

John Barnett Humphrey, of Southampton, engineer, for certain improvements in shipping generally, and in steam-vessels in particular; some of these improvements being, individually, novel, and some the result of novel application or combination of parts already known.—Sealed 10th July.

List of Patents

Granted for SCOTLAND, subsequent to June 22nd, 1841.

To William Ryder, of Bolton, roller and spindle-maker, for certain improved apparatus for forging, drawing, moulding or forming shafts, spindles, rollers, bolts, and various other like articles.—Sealed 23rd June.

John Mc Bride, manager of the Nursery Spinning and Weaving Mills, Glasgow, for certain improvements in the machinery and apparatus for dressing and weaving of cotton, silk, flax, wool, and other fibrous substances.—Sealed 25th June.

Andrew Kurtz, of Liverpool, manufacturing chemist, for certain improvements in the construction of furnaces.—Sealed 25th June.

Thomas Young, of Queen-street, London, merchant, for improvements in lamps.—Sealed 28th June.

William Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for certain improvements in machinery or apparatus for picking and cleaning cotton and wool,—being a foreign communication.—Sealed 29th June.

Morris West Ruthven, of Rotherham, engineer, for a new mode of increasing the power of certain media when acted upon by rotatory fans or other similar apparatus.—Sealed 30th June.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for certain improvements in fire-grates, and in parts connected therewith, for furnaccs for heating fluds.—Sealed 8th July.

John Swindells, of Manchester, manufacturing chemist, for certain improvements in the manufacture of artificial stone, cement, stucco, and other similar compositions.—Sealed 9th July.

John Rangeley, of Camberwell, London, for improvements in the construction of rail-ways, and in the manner of applying power to propelling carriages and machinery.—Sealed 15th July.

New Patents

SEALED IN ENGLAND.

1841.

To John Chater, of the Town of Nottingham, machine-maker, and Richard Gray, of the same place, lace manufacturer, for improvements in machinery for the purpose of making lace and other fabrics, traversed, looped, or woven.—Sealed 26th June—6 months for inrolment.

Willoughby Methley and Thomas Charles Methley, of Frith-street, Soho, ironmongers, for improvements in machinery for raising, lowering, and moving bodies or weights,—being a communication.—Sealed 26th June—6 months for inrolment.

Moses Poole, of Lincoln's Inn, gent., for improvements in producing and applying heat,—being a communication.—Sealed 26th June—6 months for inrolment.

William Losh, of Little Benton, Northumberland, Esq., for improvements in the manufacture of railway wheels.—Sealed 26th June—6 months for inrolment.

Nathaniel Benjamin, of Camberwell, gent., for improvements in the manufacture of type,—being a communication.—Sealed 28th June—6 months for inrolment.

William Knight, of Durham-street, Strand, gent., for an indicator for registering the number of passengers using an omnibus or other passenger vehicle.—Sealed 28th June—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, gent., for improvements in the manufacture of mattrasses, cushions, paddings or stuffings; and in carpets, rugs, or other napped fabrics.—Sealed 28th June—6 months for inrolment.

William Thomas Berger, of Upper Homerton, gent., for improvements in the manufacture of starch.—Sealed 28th June—6 months for inrolment.

Thomas Machell, of Soho-square, surgeon, for improvements in raising and conveying water and other fluids.—Sealed 28th June—6 months for inrolment.

George Henry Phipps, of Deptford, engineer, for improvements in the construction of wheels for railway and other carriages.—Sealed 2nd July—6 months for inrolment.

Thomas Hagen, of Kensington, brewer, for an improved bagatelle board.—Sealed 7th July—2 months for inrolment.

George Onions, of High-street, Shoreditch, engineer, for im-

proved wheels and rails for rail-road purposes.—Sealed 7th July—6 months for inrolment.

Robert Mallet, of Dublin, engineer, for certain improvements in protecting cast and wrought-iron, and steel, and other metals from corrosion and oxidation; and in preventing the fouling of iron ships, or ships sheathed with iron, or other ships, or iron buoys, in fresh or sea water.—Sealed 7th July—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in the manufacture of fuel,—being a communication.—Sealed 7th July—6 months for inrolment.

Thomas Fuller, of the City of Bath, coach-maker, for certain improvements in retarding the progress of carriages under certain circumstances.—Sealed 7th July—6 months for inrolment.

Andrew Mc Nab, of Paisley, North Britain, engineer, for an improvement or improvements in the making or construction of meters or apparatus for measuring water or other fluids.—Sealed 7th July—6 months for inrolment.

Charles Wheatstone, of Conduit-street, gent., for improvements in producing, regulating, and applying electric currents.—Sealed 7th July—6 months for inrolment.

John Steward, of Wolverhampton, Esq., for certain improvements in the construction of piano-fortes.—Sealed 7th July—6 months for inrolment.

Thomas Young, of Queen-street, merchant, for improvements in lamps.—Sealed 9th July—6 months for inrolment.

Charles Payne, of South Lambeth, chemist, for improvements in preserving vegetable matters where metallic and earthy solutions are employed.—Sealed 9th July—6 months for inrolment.

William Henry Phillips, of Manchester-street, Manchester-sq., civil engineer, and David Hickinbotham, of the same place, Gent., for certain improvements in the construction of chim-

nies, flues, and air tubes, with the stoves and other apparatus connected therewith, for the purpose of preventing the escape of smoke into apartments, and for warming and ventilating buildings.—Sealed 13th July—6 months for inrolment.

Benjamin Beale, of East Greenwich, engineer, for certain improvements in engines, to be worked by steam, water, gas, or vapours.—Sealed 13th July—6 months for inrolment.

Moses Poole, of Lincoln's-inn, Gent., for improvements of steam baths and other baths,—being a communication.—Sealed 13th July—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in the construction of locks, latches, or such kinds of fastenings, for doors and gates, and other purposes to which they may be applicable,—being a commucation.—Sealed 14th July—6 months for inrolment.

Thomas Peckston, of Arundel-street, Strand, Bachelor of Arts, and Philip Le Capelain, of the same place, coppersmith, for certain improvements in meters, for measuring gas and other aeriform fluids.—Sealed 15th July—6 months for inrolment.

Andrew Smith, of Belper, engineer, for certain improvements in the arrangement and construction of engines to be worked by the force of steam or other fluids; which improved engines are also applicable to the raising of water or other liquids.—Sealed 21st July—6 months for inrolment.

John Mc Bride, manager of the Nursery Spinning and Weaving Mills, Hutchesontown, Glasgow, for certain improvements in the machinery and apparatus for dresssing and weaving cotton, silk, flax, wool, and other fibrous substances.—Sealed 21st July—4 months for inrolment.

John White Welch, of Austin Friars, merchant, for an improved reverberatory furnace, to be used in the smelting of copper ore or other ores which are or may be smelted in reverberatory furnaces.—Sealed 21st July—6 months for inrolment.

Frederick Theodore Philippi, of Belfield Hall, calico printer, for

certain improvements in the production of sal-ammoniac, and in the purification of gas for illumination,—being a communication.—Sealed 21st July—6 months for inrolment.

William Ward Andrews, of Wolverhampton, ironmonger, for an improved coffee pot.—Sealed 21st July—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in machinery for making pins and pin nails,—being a communication.—Sealed 28th July—6 months for inrolment.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for improvements in high pressure and other steam boilers, combined with a new mode or principle of supplying them with water.—Sealed 28th July—6 months for inrolment.

Anthony Bernhard Von Rathen, of Kingston-upon-Hull, engineer, for a new method or methods, (called by the inventor "The United Stationary and Locomotive System,") of propelling locomotive carriages on railroads and common roads, and vessels on rivers and canals, by the application of power produced or obtained by means of machinery and apparatus unconnected with the carriages and vessels to be propelled.—Sealed 28th July—6 months for inrolment.

ERRATUM.

In Vol. XVIII., page 366, line 12, instead of "astride such furnace," read "outside such furnace."

CELESTIAL PHENOMENA for August, 1841.

D.	H.	M.	
1			Clock before the sun, 6m. 0s.
	—		☽ rises 7h. 32m. A.
	—		☽ passes mer. 11h. 48m. A.
	—		☽ sets 3h. 0m. A.
2			☽ eclipsed invis. at Greenwich.
	10	2	Ecliptic oppo. or ○ full moon
3			Occul Aquarii im. 16h. 51m. em. 17h. 57m.
5			Clock before the sun, 5m. 41s.
	—		☽ rises 8h. 28m. A.
	—		☽ passes mer. 1h. 54. M.
	—		☽ sets 7h. 45m. M.
	—		Occul λ in Piscium, im 15h. 37m. em. 16h. 29m.
	9	24	♃'s first satt. will em.
	17	50	Her: in conj. with the ☽ diff. of dec. 5. 5. S.
6	8	13	☿ stationary.
	14	26	♃ stationary.
9			♄ in Aphelion
	—		Occul *b* Pleiadum, im. 10h. 36m. em. 11h. 35m.
	—		Occul *g* Pleiadum, im. 10h. 47m. em. 11h. 20m.
	—		Occul *c* Pleiadum, im. 11h. 12m. em. 11h. 42m.
	—		Occul *d* Pleiadum, im. 11h. 13m. em. 11h. 40m
	—		Occul *y* Tauri, im. 11h. 33m. em. 12h. 17m.
	—		Occul *h* Pleiadum, im. 12h. 23m em. 12h. 43m.
10			Clock before the sun, 5m. 4s.
	—		☽ rises 9h. 59m. A.
	—		☽ passes mer. 5h. 38m. M.
	—		☽ sets 2h. 2m. A.
	6	19	☽ in □ or last quarter.
12			Occul 139 Tauri, im. 13h. 48m.
13	4	59	♀ in conj. with the ☽ diff. of dec. 5. 17. S.
	—		Occul ω Geminorum, im. 13h. 25m. em. 14h. 3m.
15			Clock before the sun, 4m. 13s.
	—		☽ rises 2h. 25m. M.
	—		☽ passes mer. 10h. 43m. M.
	—		☽ sets 6h. 39m. A.
	1	6	☿ in conj. with the ☽ diff. of dec. 1. 13. S.
	2	24	☿ greatest elong. 18. 37. W.
	18		☽ in Perigee.
16			☉ eclipsed, invis. at Greenwich.
	9	33	Ecliptic conj. or ● new moon.
17			Mercury R.A. 8h. 32m. dec. 18. 22. N.

D.	H.	M.	
	—		Venus R. A. 6h. 44m. dec. 20. 55. N.
	—		Mars R. A. 14h. 58m. dec. 18. 34. S.
	—		Vesta R. A. 2h. 24m. dec. 4. 49. N.
	—		Juno R. A. 12h. 46m. dec. 1. 26. N.
	—		Pallas R. A. 22h. 50m. dec. 6. 12. N.
	—		Ceres R. A. 1h. 58m. dec. 1. 29. S.
	—		Jupiter R. A. 16h. 34m. dec. 21. 34. S.
	—		Saturn R. A. 17h. 45m. dec. 22. 28. S.
	—		Georg. R. A. 23h. 37m. dec. 3. 19. S.
	—		Mercury passes mer. 22h. 51m.
	—		Venus passes mer. 21h. 1m.
	—		Mars passes mer. 5h. 14m.
	—		Vesta passes mer. 16h. 39m.
	—		Juno passes mer. 3h. 3m.
	—		Pallas passes mer. 13h. 5m.
	—		Ceres passes mer. 16h. 31m.
	—		Jupiter passes mer. 6h. 50m.
	—		Saturn passes mer. 8h. 1m.
	—		Georg. passes mer. 13h. 52m.
	9	7	♃'s second satt. will em.
18	9	2	♃'s third satt. will em.
18	20	38	☿ in the ascending node
20			Clock before the sun, 3m. 9s.
	—		☽ rises, 9h. 49m. M
	—		☽ passes mer. 3h. 3m. A.
	—		☽ sets 8h. 4m. A.
21			Vesta greatest Hel. Lat. S.
22	16	39	♂ in conj. with the ☽ diff. of dec. 3. 39. N.
23	9	10	☽ in □ or first quarter.
23	10	7	☿ in Perihelion.
24	6	2	♃ in conj. with the ☽ diff. of dec. 4. 45. N.
25			Clock before the sun, 1m. 53s.
	—		☽ rises 3h. 53m. A.
	—		☽ passes mer. 7h. 17m. A.
	—		☽ sets 10h. 42m. A.
	12	40	♄ in conj. with the ☽ diff. of dec. 4. 28. N.
	—		Occul 3 Sagittarii im. 9h. 37m. em. 10h. 51m.
26			Ceres stationary.
28	1		☽ in Apogee.
30	22	17	♄ stationary.

J. LEWTHWAITE, Rotherhithe.

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No. CXVII.

Recent Patents.

In presenting to our readers the recently patented improvements connected with the deposition of metals by electric action, we consider it advisable to place them chronologically, in order that, together with the papers which have already appeared upon that subject in our Journal, they may, as it were, form a history of this newly developed art.

The first specification here given cannot possitively be said to belong to the electrotype process; but when looked upon as the precursor of the latter improvements, we could not consider our series complete without it.

As a striking illustration of the principles of Electrometallurgy being usefully applied, before the experiments of Mr. Spencer brought the discovery into notice, (see Vol. XV. and XVI. of our Journal,) we beg to refer to the specification of Messrs. Elkington and Barratt, in which it will be perceived that articles were coated with zinc by keeping them in contact with pieces of that metal in a solution of the same; and in the instances of the other patents

of Messrs. Elkington, the operation was due to electric action. But a limit here existed to the extent of depositing the metal, the electric circuit being destroyed the moment the article was perfectly coated; a considerable thickness of the reduced metal being thereby unattainable; but even this difference did not exist in an experiment which was for many years practised in lectures on galvanic electricity; many of our readers have, no doubt, seen it performed;—it consisted in immersing two platinum blades in a solution of sulphate of copper, connecting one to the positive and the other to the negative pole of a voltaic battery; by which arrangement, that connected to the former became coated with metallic copper; the blades were then changed, when the copper, formerly precipitated, and now in connection with the negative pole, became dissolved and transferred to that in connection with the positive pole. Not only, however, was this daily repeated, but it was generally a matter of some anxiety to the lecturer to avoid getting the deposited metal too thick.

We are told, that Professor Daniel (whose invaluable invention of the sustaining battery led directly to the discovery of the electrotype) had long noticed the deposition of copper, which accumulated upon the surface of his cells; and, on displacing it from the metal to which it adhered, perceived and pointed out the fact, that the minutest scratches were faithfully copied; but the researches of theory, the depths of abstract science, conquered in him the power of practical application; and not to the great but to the no less meritorious are we indebted for the direct introduction of the important art of Electro-metallurgy.

Having taken this matter under our especial care, we shall, from time to time, afford our readers information of its progress in the fine and useful arts.

To Henry Elkington, *of Birmingham, Gent., for improvements in gilding and silvering certain metals; and also improvements in certain vessels or apparatus used in such processes, and for other purposes.*—[Sealed 4th December, 1837.]

These improvements in gilding and silvering consist in effecting those objects by employing solutions of gold and silver in combination with other salts. The following are the modes of operating therewith:—

Dissolve one ounce, troy weight, of fine gold in nitro-muriatic acid, composed of three fluid ounces of nitric acid, (specific gravity 1.45,) and three ounces of muriatic acid, (specific gravity 1.15,) diluted with three ounces of distilled water; when the gold is dissolved, the solution is to be diluted with two quarts of water, and the gold precipitated by a solution composed of two ounces of silver, dissolved in one ounce of nitric acid, diluted with two ounces of water; after which, two quarts of water are to be added, and the precipitate well washed; it is then to be re-dissolved in ten ounces, avoirdupoise, of chloride of sodium, (common salt,) diluted with three quarts of water, and the solution carefully filtered. The patentee states, that he usually adds twenty ounces, avoirdupoise, of chloride of sodium (common salt) and twenty ounces of borax, (borate of soda); the solution is then to be boiled for about a quarter of an hour. If a pale coloured gold should be required, a small quantity of chloride of silver may be added; sometimes salts of sodium or potassium are used; or the sulphates and nitrates, with the borates of soda or potash, as above; but the patentee prefers using that combination before mentioned.

Another mode may be adopted by dissolving one ounce,

troy weight, of fine gold in aqua regia, consisting of two fluid ounces of nitric acid, (specific gravity 1.45,) diluted with three ounces of water, added to three ounces of chloride of sodium; to which is added twenty ounces, avoirdupoise, of borax and thirty-two of chloride of sodium with water, in sufficient quantity to dissolve the salts. The solution of gold must, in this case, be boiled first with the borax, and then the chloride of sodium added; after which the whole boiled for half an hour.

The articles to be gilt are first well cleansed from all scales, dirt, or grease; and if they be small, as rings or other similar articles of dress, they may be strung together and placed in that manner in the solution, when they will acquire, by remaining there from a few seconds to a minute, a sufficient coating; but care should be taken to remove them as seldom as possible from the solution before they are finished. If it be required to produce the dead effect, it may be done by the process adopted by brass-founders, or by other known means. The above mode is that which the patentee adopts for gilding articles of brass or copper; but it will be necessary to vary the same in some degree for coating other metals; for silver, for instance, the same solution of gold and other salts may be used as above described; but when the articles have acquired a pale gold colour, they are to be transferred to the following solution:—for every ounce of gold, as above, are to be added ten ounces each of potash and alum, boiled together for half an hour, by which means a much stronger coating of gold will be obtained.

For gilding iron or steel, the patentee states that he usually dissolves borax in the solution of gold as before, but now adds, for every ounce of gold so dissolved, four ounces of borax; and when the solution assumes a greenish hue, four ounces of nitrate of potash are to be added, or

chloride of sodium, or as much as is found necessary, according to the nature of the articles. In a similar manner zinc and other metals may be gilt by adapting the solution to their respective qualities;—for zinc, the patentee finds to answer best a solution of gold with borax only, and more diluted with water.

In using the solution of gold with ammonia, if it be that first described, for every ounce of gold twenty ounces of muriate of ammonia and one pennyweight of bichloride of mercury are to be added, and the whole boiled until the salt is dissolved. If the solution should be found to contain free acid, some carbonate of ammonia should be added; if the articles assume a dark hue, and when coloured possess a dull red appearance, a small quantity of bichloride of mercury should be placed in the solution; if it be found that they are too pale, it is in consequence of the presence of too much bichloride of mercury.

In concluding this part of his specification, the patentee remarks, that although he has mentioned certain proportions of the ingredients, yet he does not confine himself thereto, as they may be varied without departing from the nature of his invention; that which he claims, being the application of a solution of gold combined with any convenient salt, by preference of potassium, sodium, or ammonia, (excepting carbonate of potash and soda,) and preferring chlorides of potassium and sodium, with borates and with muriate of ammonia, for gilding, as above described.

In order to obtain a coating of silver, that metal is to be dissolved in nitric acid, as is well understood; and for every ounce, troy weight, so dissolved, is to be added one gallon of water; the metal is then to be precipitated by chloride of sodium, or other convenient means. The precipitate is then to be dissolved in muriatic acid, and boiled for a quarter of an hour, and when cool it will be fit for use.

The articles, when thoroughly cleaned, may be introduced in any convenient manner; but it will be necessary, during the operation, to add occasionally some chloride of silver, in order that the solution may be kept saturated therewith. The above solution is intended for silvering articles of a common character; for those of a better description, the patentee prefers the following method:—

The chloride of silver is to be dissolved in any convenient salt, by preference chloride of sodium or potassium, and muriate of ammonia; and the patentee usually employs the muriate of ammonia in the following manner:—To one ounce, troy weight, of chloride of silver add one pound, avoirdupoise, of muriate of ammonia, and two pennyweights of bichloride of mercury, more or less, with water, sufficient to dissolve the salts; this mixture is to be boiled for half an hour, and retained at that heat while in use. The articles to be silvered, being thoroughly cleaned, are placed in the solution and stirred about therein until they have acquired a sufficient coating. The quantity of bichloride of mercury used will depend upon the substance to be silvered;—for copper or brass, from four to five pennyweights will be found to answer; and care should be taken to add more bichloride of silver as the solution becomes weakened. If the deposit of silver should be found to peel off, more bichloride of mercury should be added to the solution. When a sufficient deposit of silver is acquired, the mercury is to be dispelled from the articles by the application of heat, and they should be quenched in diluted muriatic acid.

The patentee states, that under this head of his invention he does not claim in themselves any of the substances used, metals having before been silvered by the use of salts and chloride of silver; but this has been in a state of paste, and effected by rubbing; but he claims the application of the

solution of chloride of silver instead of the paste, and dipping instead of rubbing for the purpose of silvering.

The next part of his invention consists in forming vessels used in the above processes, and for culinary and other purposes, of iron or other metal, with a lining of glazed earthenware. In order to effect this the patentee states, that he "mixes together two parts of carbonate of potash, or an equivalent quantity of potash, soda, or carbonate of soda, two parts fine clay, (pipe or porcelain clay,) and eight parts of pure sifted sand, and reduces them to the consistence of thick cream by the addition of water;" with this mixture the interior of the vessel is to be coated by pouring a quantity in and turning it round; it is then allowed to stand by some time until it becomes dry, when it is taken to a kiln and there heated to a red heat; a glaze is then put upon it by any of the ordinary means; or a thin layer of glass may be blown therein. It is stated, that by means of these two coats, the enamel will be prevented from breaking through the expansion of the metal vessel.—[*Inrolled in the Inrolment Office, June,* 1838.]

To George Richards Elkington *and* Oglethorpe Wakelin Barratt, *of Birmingham, in the county of Warwick, manufacturers, for their invention of improvements in coating and colouring certain metals.*—[Sealed 24th July, 1838.]

These improvements consist, first, in certain modes of coating or covering metallic surfaces with zinc, or an amalgam of zinc, for the purpose of preventing oxydation; and secondly, in a mode of colouring surfaces of iron or steel, so as to give them the outward appearance of brass.

The first mode which the patentees adopt, in order to coat surfaces of brass or copper, is as follows:—To seven parts of muriatic acid (of specific gravity 1.16) are to be added one hundred parts of water, each by weight; in this solution is thrown four parts of zinc, pulverized or broken into small pieces; the whole is then to stand in an earthen vessel for about twenty-four hours, or until all action ceases between the zinc and the acid; some pieces of zinc are then to be placed in it, and the whole boiled; during which operation, the articles of brass or copper, intended to be coated, are placed therein, taking care that they are brought in contact with the pieces of zinc last added, when they will speedily become coated with metallic zinc.

When it is desired to coat articles formed of iron or steel, they are first to be immersed in a "pickle," or acid solution, so as to render them perfectly clean; after which they are to be placed in a solution of sulphate or other salt of copper, by which means they will acquire a film or coating of that metal, and be prepared for undergoing the process above described, for the purpose of obtaining a coating of zinc; after which, if desired, another film of copper may be deposited upon them, as before described; and subsequently a further coating of zinc. But the patentees state, that if they are immersed in a solution of nitrate of mercury, and then in the solution of zinc, the effect will be the same.

Another plan which may be adopted for coating iron and steel surfaces, is to make a solution of one part of muriatic acid (specific gravity 1.16) to thirty parts of water; and having placed small pieces of zinc therein, introduce the articles to be coated, keeping them in contact therewith.

The next process described, is that of coating surfaces with an amalgam of zinc; and, in order to effect this, it is preferred to form the amalgam by adding to six or seven parts of zinc one of mercury, which may be effected by

means of heat, or by stirring the substances in muriatic or other proper acid. For this purpose, the zinc should be ground, or otherwise reduced into small particles. To the amalgamized zinc, when effected by heat, is to be added diluted muriatic acid, as before, and the substances to be coated introduced therein, and occasionally stirred in contact with it; or, instead of muriatic acid, certain salts may be employed,—muriate or sulphate of ammonia, or acetic or sulphuric acid; and it is preferred to use these solutions hot, as in that case the process of coating will be effected in a much shorter time; but it may be done equally well if no heat is applied. If thought desirable, surfaces may be coated with this amalgam by the application of heat; but in this case they must be previously immersed in a weak acid solution; and, in order to produce a perfect union with the amalgam, they should also be held in a solution of muriate of ammonia.

Instead of metallic zinc and mercury, oxides of these metals may be used with equal advantage. The patentees state it, as well known, that metallic surfaces may be coated with a mixture of tin and zinc, when in a fluid state; and that part of their improvements consist in the combination of this known process, with that portion of the invention above described.

In order to colour articles of iron or steel, according to the second part of these improvements, they are first to be coated with copper by immersion in the solution of a salt of that metal, as above described; a thin film of zinc is then deposited upon them as before, when they are carefully washed and dried in saw-dust; after which they are placed in a close oven, and heat being applied thereto, they will acquire a colour resembling that of brass.

The patentees in conclusion remark, that they are aware that surfaces have been coated with films of zinc before,

but such coating has merely been used in order to colour articles of copper by a subsequent application of heat, which would defeat the object of their present invention; what, therefore, they claim is, firstly, the mode above described of coating brass and copper with zinc, in order to prevent oxydation; secondly, the combined use of zinc and mercury for coating metals to prevent oxydation; thirdly, the modes of coating iron and steel with zinc, to prevent oxydation; fourthly, coating iron and steel by first covering the same with copper and then with zinc; and fifthly, colouring iron and steel by coating it with copper, then with zinc, and subsequently applying heat thereto.—[*Inrolled in the Inrolment Office, January,* 1839.]

To JOSEPH SHORE, *of Birmingham, merchant, for improvements in preserving and covering certain metals and alloys of metals.*—[Sealed 3rd March, 1840.]

THESE improvements have for their object the coating or covering manufactured articles composed of wrought or cast-iron, lead, and copper, and its alloys, with copper or nickel; such coating being effected by means of galvanic electricity. And as the manipulation for such purposes is now well understood, we believe no particular description to be necessary, the mode being precisely the same as that ordinarily employed for obtaining copies of medals, engraved plates, &c.

The patentee does not confine himself to any particular arrangement of apparatus, but claims the mode of treating manufactured articles, of the metal and alloys above stated, so as to obtain a permanent coating or covering of copper or nickel.—[*Inrolled in the Inrolment Office, September,* 1840.]

To George Richards Elkington, *and* Henry Elkington, *of Birmingham, for improvements in coating, covering, or plating certain metals.*—[Sealed 25th March, 1840.]

These improvements are described under four heads in the specification of the patentees; consisting, firstly, in a mode of coating copper and its alloys, as brass, &c. with a film of silver, by means of fusing it upon the surface of the metal so to be coated; secondly, in the use, for the purpose of silvering, of a certain solution of silver, and in the application of a current of electricity connected therewith; thirdly, in the use of a certain solution of gold, and in the application of a current of electricity connected therewith; and fourthly, in a mode of cleaning surfaces of iron, so as to bring them into a fit state for receiving a coat or covering of other metals.

In order to carry the first part of these improvements into effect, the article to be operated upon is first to be silvered by any of the ordinary means; but the patentees prefer accomplishing this by the process described in the specification of a patent granted to Henry Elkington, bearing date December 4th, 1837, (see London Journal, present Number, page 75,) or that mode hereinafter described, without the use of the voltaic battery. The articles so silvered are then to be immersed in a hot solution of nitrate of silver, more or less concentrated, according to the thickness of the coating of metallic silver; heat is then applied until the whole of the acid is driven off, leaving merely a metallic coating of silver, which will be the case when the articles have attained a dull red heat; and if they are found, when cool, to present a whitish appearance, they are prepared for the subsequent operation of fusion. In order to

effect this, a quantity of calcined borax is placed in an iron vessel, and submitted to heat until it is in a perfectly fluid state, and of a sufficient temperature to melt silver, which may be ascertained by occasionally dipping in a piece of plated metal.

The silvered articles are now to be placed in the fused borax, and stirred quickly round, care being taken not to keep them in a sufficient time to melt the copper or other metal composing the body of the article. The workman will ascertain when the silver is perfectly fused by removing it from the vessel; for if the borax then runs off, leaving the surface bright, the operation is complete; but should the borax, on the contrary, adhere thereto, more time will be required to perfect the fusion. The articles should now be cooled, and subsequently boiled in diluted sulphuric acid, of the strength of about one of acid to twelve of water, until the small portions of borax hanging about them are removed; after which, in order to effect a finish, they may be treated according to any of the ordinary modes, or, (as the patentees prefer,) receive a thin coating of fine silver by means of galvanism, as hereafter described.

The patentees claim, under this head of their invention, the mode of coating copper and its alloys, as brass, &c., by fusing silver upon the surface thereof, whereby it becomes alloyed or united with the metal so coated.

The solution of silver, the use of which forms the second part of this invention, is constituted as follows:—To three pounds of prussiate of potash, (cyanide of potassium,) dissolved in three gallons of water, are to be added five ounces of oxide of silver, and the whole agitated or boiled until thoroughly dissolved. Instead of the prussiate of potash prussiate of soda may be employed; but the patentees prefer the former. The solution is now ready for use, and the articles having been thoroughly cleaned are introduced

therein. If a thin coating be desired, the patentees prefer using the solution boiling, when from a few seconds to a minute will produce the required effect; but if a thicker coating be desired, for the better description of goods, as plated ware, then the preferred mode is to use the solution cold, and apply a current of electricity to the articles to be coated;—this may be effected by any of the ordinary means; but the patentees prefer using those batteries known as sustaining batteries. Should the articles be submitted to this latter process, the metal deposited upon them will assume a chrystalline appearance; if, therefore, a bright surface should be required, they must be finished with a wire brush, as is well understood; but if a deadened surface be desired, it may be obtained by annealing and boiling in dilute sulphuric acid, according to the usual method.

The patentees state, that it will be found necessary to add, from time to time, a fresh supply of the oxide to the solution, in order that it may be kept saturated with that salt.

When using the battery, the chloride, cyanide, or other salts, insoluble in water, may be used; and the patentees have sometimes employed a solution of the iodide in hydriodate of potash or soda, and occasionally the nitrate, oxide, or chloride of silver, in pure ammonia; but these are not so available. Other solutions may also be used, such, generally, as the ammoniacal solutions, or solutions of the chloride in the muriates of potash or soda; but these are found to be difficult of treatment.

Another mode of applying the battery is, first, to coat the article with silver, by the process first above described, or by other means; and, this being done, a further deposit may be effected by using a simple solution of silver, constituting a neutral salt; but this is not preferred.

The above modes are described as applicable only to

copper and its alloys; but, should it be required to silver surfaces of iron, it may be done by first cleaning the metal as hereafter described. Zinc and tin may also be coated as above.

The patentees claim, under this head of their invention, firstly, coating metals with silver by the use of oxide of silver, dissolved in prussiate of potash or other analogous salt, or in pure ammonia; secondly, the use of a solution of silver in prussiate of potash or other analogous salt, or in pure ammonia in combination with a galvanic current; and thirdly, the use of a solution of silver in acid, so as to constitute a neutral salt in connection with a galvanic current;—the articles in this case having been previously coated with silver.

The third head of the invention is as follows:—Two ounces of fine gold, converted into oxide, are to be dissolved in a solution of two pounds of prussiate of potash or soda in one gallon of water, and the whole boiled half an hour, when the solution will be ready for use. The articles to be gilt are immersed in the solution while boiling, and if a thin coating only be desired, the operation will be complete in from a few seconds to a minute; but if it be required to obtain a thicker deposit, the solution should be used cold, and in connection with a current of electricity, taking care to keep it saturated with the salt.

The patentees sometimes employ a solution of protoxide of gold (purple of cassius) in the muriates of potash, soda, or other soluble muriates; but this they do not find so desirable in practice, generally preferring those salts combining with gold in a low state of oxydation, and forming compound salts, having double bases, and which are found principally in that class termed "haloid salts;" those also capable of dissolving gold in a metallic state, as prussiate of potash, are applicable, but with different degrees of

efficacy. The best of all the above solutions the patentees consider to be that of oxide of gold in prussiate of potash.

Should it be desired to gild surfaces of iron with the assistance of the battery, a similar plan may be adopted to that described with reference to silvering by first slightly gilding the articles by any convenient method, and subsequently introducing it into one of the above solutions, and in connection with the voltaic battery.

The patentees claim, under this head of their invention, the use of a solution, for the purpose of gilding, formed of oxide of gold, dissolved in prussiate of potash, or soda, or any other analogous salt, and combining the action of a galvanic current with the use of a salt of gold as above, preferring the solution of gold formed by dissolving oxide of gold in prussiate of potash; and, further, the patentees claim, with reference to the two last heads of their invention, the application of a galvanic current, in combination with solutions of gold or silver for coating or plating with gold or silver, whether the articles to be so coated are formed entirely of metal, or only partly so.

The last head, viz.,that of preparing surfaces of iron to receive a coating of copper or other metal, consists in causing such iron surfaces to assume an electro-negative state while under the action of the acid, which is the cleaning medium. To effect this, the articles are to be connected to a piece of zinc, and placed in a solution composed of one part of sulphuric acid to one of water; after a short time the scales and dirt will fall from the iron, leaving its surface perfectly clean and bright; after which, if it be intended to coat the articles with copper, they are placed in a brass vessel containing a saturated solution of sulphate copper, with the addition of a little sulphuric acid; when, after keeping them there a short time, they will have obtained a firm coating of copper, and may be treated, if desired, as described with reference to the second and third head of these improvements.

The claim under this portion of the invention, is the method of coating iron with other metals, by the employment of the above mode of cleaning, as preparatory.—[*Inrolled in the Inrolment Office, September*, 1840.]

To THOMAS SPENCER, *of Liverpool, carver and gilder, and* JOHN WILSON, *of the same place, lecturer on chemistry, for certain improvements in the process of engraving on metals by means of voltaic electricity.*—[Sealed 7th October, 1840.]

IN order to engrave on copper by the process of the patentees, the surface thereof is to be coated with etching ground or other protecting substance, the design traced thereon, and subsequently removed with an etching point, as is now ordinarily practised by engravers; after which it is to be immersed in a solution of sulphate of copper, and connected to the negative pole of a voltaic battery, another plate of copper being placed opposite to it, and in connection with the positive pole of the battery; the effect will be the biting away or corroding of those parts of the metal which have been left unprotected by the removal of wax with the etching point; the width and depth of the lines depending upon the distance between the two plates, the quantity or intensity of the battery, or the length of time devoted to the operation.

When the surface required to be engraved is of a cylindrical form, the plate connected to the positive pole of the battery should also be of that figure, and placed so as to surround the metal to be engraved, equidistant at all parts of its circumference.

If engraving on surfaces of iron or steel, the patentees

use, instead of the sulphate of copper, a solution of common salt, and connect the positive pole of the battery to another plate of iron or steel. When the metal to be operated upon is of silver, a solution of sulphate of soda or sulphate of silver is preferred, and a silver surface connected to the positive pole; or if it be required to engrave on gold, the solution into which it is placed is hydrochloric acid, gold forming the connection with the positive pole.

In like manner the patentees state other metals (metallic surfaces) may be engraved; they, therefore, do not confine themselves to those particularly mentioned, or to the form of apparatus described, but they claim the use or application of voltaic electricity for engraving on metals generally. —[*Inrolled in the Petty Bag Office, April,* 1841.]

To JOSEPH LOCKETT, *of Manchester, in the county of Lancaster, engineer, for certain improvements in manufacturing, preparing, and engraving cylinders, rollers, and other surfaces, for printing or embossing calicos or other fabrics.*—[Sealed 27th August, 1840.]

THESE improvements in manufacturing, preparing, and engraving cylinders, rollers, or other surfaces, for printing or embossing calicos or other fabrics, consist, firstly, in the application of the power of galvanic or voltaic electricity; and by this means re-coating, covering, or thickening those cylinders, rollers, or other surfaces, which have been manufactured by this or any other process; the engraving or etching upon which is required to be obliterated, or which may have been reduced by former use, or to manufacture a new roller or cylinder by the same process.

To form a roller or cylinder by this process, a mould or

shaft is employed, of the required diameter, which may be composed of a metallic or conducting substance, and either retained as a portion of the cylinder, when formed, or it may be of a non-conducting substance, and the surface subsequently rendered a conductor of electricity, and then removed from the cylinder when it has attained the requisite thickness.

A non-conducting surface for this process may be rendered into a conductor of electricity by any of the following methods; but no claim is here made for their application to any other purposes.—It may be rendered a conductor by the application of a metallic leaf or foil of copper, tin, or gold, or combination of these or other metals, or by a metallic powder of these or any other metals, or by an application of plumbago, or a solution of nitrate of silver in the first instance, and subsequently deoxidised by a salt or gas, having a greater affinity for oxygen than the salt of silver.

The mould or foundation of the cylinder having a metallic surface, or prepared by any of the preceding methods, must now be placed in a vessel containing a solution of a salt of copper, or water containing about one-sixtieth of its weight of sulphuric acid, (the oil of vitriol of commerce.)

It must now have one end of a copper wire attached to it, the other end of which must be in connection with the positive end of the galvanic battery, having any number of exciting elements; this is to be regulated by the amount of surface exposed on the mould.

Another metallic surface must now be placed in the vessel containing the mould, and opposed to the surface required to be deposited on. In like manner this other metallic surface must have one end of a wire attached to it, the other end of which must be in communication with the negative end of the battery. The battery for these pur-

poses may be excited by any of the methods already known; but the sustaining one is preferred. Should it be desirable to perform this process in one vessel, and without the aid of the battery, it will then be necessary to attach the mould or surface to be deposited on to a metal, having a greater affinity for oxygen than copper, as zinc or iron; and it then becomes necessary to keep up a supply of a salt of copper in that portion of the fluid containing the surface to be deposited on.

In operating with one vessel, it is divided into two compartments by a porous substance, as unglazed earthenware or sheep's skin, one compartment containing the zinc and the other the copper, In the division containing the zinc, there may be placed water, slightly acidulated; in the other a solution of a salt of copper. Should it at any time be found necessary to add to the thickness, or give a coating of copper to a collar or cylinder already manufactured, either by the above process, or by the methods at present in use, the process above described will effect that purpose, care being taken that the surface to be thickened or recoated is perfectly clean, which may be effected by immersion in a solution of nitric acid of commerce, diluted with about twenty times its bulk of water.

The second part of these improvements consist in a peculiar method of preparing surfaces by galvanic or voltaic electricity, applicable to cylinders, plates, or blocks, for printing or embossing calicos and other fabrics. When a cylinder plate or block, used for printing, has been engraved on by any of the methods at present in use, or when etched by an acid, it often becomes necessary to obliterate or stop out a portion of the already engraved ground, in order that portions may be rendered plain, and according to a given pattern or design.

To effect this object, a coating of varnish is given to

those portions of the surface which it is intended shall retain the originally engraved ground, leaving exposed the pattern or portions of the surface it is intended should be filled up with copper, to be deposited by the electrical action. The exposed portions must be cleaned by diluted nitric acid.

The block cylinder or other surface so prepared must now be placed in a vessel containing a solution of a salt of copper, and connected by a wire or slip of metal, with the positive end or plate of a galvanic battery, or a single pair of elementary plates. A surface of copper must then be placed in the vessel containing the block or cylinder, which must be in connection with the negative pole or plate of the battery. The prepared surface may itself be made to form the negative end of the arrangement, by being connected by a wire to the surface of a metal, having a greater affinity for oxygen than copper; and the operation, by these means, conducted in one vessel, which may be separated into compartments by the interposition of a porous substance.

The third part of these improvements consist in a simple mechanical contrivance, to be applied either to the ordinary slide lathe or the engraving machine, commonly used for cylindrical engraving, for the purpose of cleaning, filing, or turning off the superfluous portions of the copper thus deposited upon rollers or cylinders, and reducing the prominencies of the deposited or raised portions on the surface, to an evenness or level with the other portions of the cylinder. This is accomplished by means of a revolving cutting or filing tool, easily adjusted to its work at any part of the rollers, and which may readily be applied to machines now in use.

In Plate IV., fig. 1, is a side elevation of an ordinary turning tool, with the apparatus attached; fig. 2, is an end elevation; and fig. 3, a plan or horizontal vew of one end

of the same, shewing more particularly the cutting tool and its mounting.

The roller or cylinder to be dressed or finished by this apparatus, is represented at *a, a,* supported by and revolving on the mandril *b, b,* by means of the conical boxes *c, c,* which fit into each end of the roller or cylinder. The mandril *b, b.* is mounted in pedestals *d, d,* attached to the bed *e, e,* of an ordinary slide lathe or engraving machine, and is made to revolve by any suitable gearing. There is a horizontal bar or rest *f, f,* also attached to the bed, by means of the pedestals or supports *g, g.*

It will be seen, by reference to the end view, fig. 2, of the machine, that these supports *g, g,* are made in two parts, one being moveable and capable of adjustment, by means of the screws *h, h*; which, at this part of the pedestal, carries the bar *f,* and allows the bar to be regulated or set to the greatest precision. At the upper end of the pedestals *g, g,* there are pieces *i, i,* cut in an angular form, for the purpose of clipping the ends of the rollers, and also serving as bearings for the bar *f.* These pieces may be made of hard wood or metal, or may have small friction rollers, bearing upon the cylinder, if preferred.

The rotary cutting or filing tool *k,* is mounted in a carriage or frame *l, l,* and supported in the sliding frame *m,* by means of the pedestal *n.* The cutter is caused to revolve by means of the spur-wheel *o,* being keyed upon its axis, and in gear with the change carrier-wheels *p, q,* which may be varied to suit the speed required; and the driving power may be communicated thereto by means of a strap, attached to the spur-wheel *r,* or otherwise.

It will be observed, that the carriage *l,* is provided with a screw *s,* the lower end of which always bears upon the bar or rest *f,* and thus regulates the cut of the revolving tool *k.* The carriage *m,* with the cutting apparatus, slides

along the bed *e*, *e*, from end to end of the roller, by means of the screw *t*; or it may be slidden to any part of the bed by hand or otherwise.

The patentee claims, as his invention, the application, employment, or use of the principle, force, or power of galvanic or voltaic electricity, to the purposes herein described or set forth only; and also the rotary cutting or turning apparatus subsequently employed upon rollers or cylinders so manufactured or prepared.—[*Inrolled in the Petty Bag Office, February,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM TUDOR MABLEY, *of Wellington-street, North, in the parish of St. Paul, Covent Garden, in the county of Middlesex, mechanical draftsman, for certain improvements in producing surfaces to be used for printing, embossing, or impressing.*—[Sealed 17th December, 1840.]

THESE improvements in producing surfaces to be used in printing, embossing, or impressing, relate to certain modifications or applications of the art known as Electrography or Electro-metallurgy; such art, as is well known, relating to the precipitation of metals, from their solutions, by the agency of voltaic electricity, and consist, firstly, in the production of a printing, embossing, or impressing metallic cylinder, plate or block, having a device or pattern formed thereon, suitable for the above purposes; such device or pattern constituting one perfect or connected design, produced from an originally engraved or otherwise executed portion of the said design; secondly, in a mode of joining together engraved or otherwise executed metallic plates, so as to form one connected surface; thirdly, in obtaining an

extended plain surface to an engraved metallic plate, whereon a continuation of or addition to the subject already formed, may be engraved; fourthly, in certain modes of producing suitable surfaces, as aforesaid; such modes not requiring the ordinary original process of engraving; fifthly, in a mode of producing surfaces, as aforesaid; such surfaces being suitable for printing, or printing and embossing in various colours; sixthly, in the application and use of dies, formed by the agency of voltaic electricity, for the purpose of embossing or impressing horn, hoof, or tortoise-shell, in the manufacture of buttons; seventhly, in a mode of mounting or attaching seals, bookbinders' tools, or other such instruments, used for impressing; such instruments or tools being produced by the agency aforesaid; and lastly, in a mode of producing seals for impressing on wax or other such substance.

In order to illustrate the first part of this invention, we have shewn several diagrams which we will now proceed to describe. In Plate IV., fig. 1, represents a design for an ordinary dinner plate; and it being desired to produce a printing surface for the same, a portion, say one-fourth of the whole design, is engraved by any ordinary means, as represented at fig. 2. Such parts on which the metal is not to be precipitated, are varnished or otherwise insulated, and then placed in a vessel containing a solution of a metallic salt, (sulphate of copper for instance,) and communicated with the positive pole of a voltaic battery, or a single cell apparatus may be used; when the metal is deposited to a sufficient thickness it is removed, and the original again placed in connection with the battery, and so on until the required number of copies, (in this case four,) are obtained; these four copies (in relief) are then filed at their edges; in order to do which truly, a straight line may be scratched along the edges of the original, as at *a*, *b*, *c*, fig. 2;

they are then placed together, so as to form the entire design in relief, and soldered or otherwise held in this position; the whole is then placed in connection with the battery, when the copper being precipitated upon it, one consolidated plate will be produced, possessing the entire design. Before using it, however, those parts where the junctions were made, may be repaired, if found necessary, by the ordinary modes of engraving.

Fig. 3, represents another example of this part of the invention; in this case, the centre-piece being irregular, the design is divided as represented by the lines. Fig. 4, represents a design used in printing handkerchiefs, and may be divided, as represented by the lines, or otherwise. Fig. 5, represents a running pattern, which may be used, for instance, in the form of a block, for printing paper-hangings, calico, &c., and may be divided, as shewn in the figure.

Fig. 6, represents a design, which may be used as an embossing plate, for book-covers, and may be divided, as shewn by the lines, originally engraving those portions shewn in the detached figures. If desired, a mould may be obtained from the border, represented at fig. 3, and one from the centre-piece of fig. 1, when a plate being formed from the two, as above described, the whole will print the device represented at fig. 7.

The patentee states, that in the foregoing description he has mentioned the use of moulds, formed by voltaic electricity, but that they may be produced by any other convenient means, as by pressure with soft metal, &c.; and that he has described this head of his invention generally. The mode which he prefers of joining electrotype moulds together, is as follows:—

Before placing the portion of the design, fig. 2, in connection with the battery, bars or ribs (by preference of

metal) are affixed, by means of clamps or otherwise, along those edges of the design which are intended to be joined to the edges of another portion, as shewn at *a*, *a*, in the plan, or horizontal and sectional views, figs. 8 and 9. When, certain parts being varnished or otherwise insulated, the metal will be precipitated, as shewn at *b*, *b*; which precipitated metal, when removed, will be formed with flanges, as shewn at figs. 10 and 11; by this means solder or other adhesive matter can be dispensed with in connecting the portions together, as shewn at figs. 12 and 13. Fig. 12, is a side view of the several portions united together; and fig. 13, is an under side view of the same; against the back of the flanges formed on the precipitated metal moulds *b*, *b*, are placed stiff bars of metal *c*, *c*, which bars are tightly pressed together by the clamps *d*, *d*, thus bringing the edges of the moulds closely in contact; but should they not meet sufficiently close, a washer of very thin sheet lead may be placed between them.

The patentee remarks, that this part of his invention will apply with advantage to many other purposes than those mentioned,—as in producing plates for the purposes of embossing, or embossing and printing woollen or other table covers and hangings; and that if it be desired, the finished plates or blocks may be subsequently coiled around a drum or mandril, in order to print from a cylindrical surface.

The second head of the invention, viz., a mode of joining together engraved metallic plates, is shewn at figs. 14 and 15. The finished or engraved plates are shewn at *e*, *e*; along the edges of each of which, where it joins another, a groove *f*, is formed, as shewn in the detached views, figs. 16 and 17; they are then brought together and held in that position. The grooves *f*, *f*, are then washed with dilute nitric acid, and the metal deposited, as shewn at *g*, *g*,

fig. 14, which will firmly unite the parts together; but if thought desirable, the whole of the back may be coated, instead of the grooves only.

The third head of the invention consists in taking a mould of an engraved plate, and soldering or otherwise attaching thereto, as described above, a plain metallic or other surface, and then submitting the whole to the action of the battery in the metallic solution, when a plate will be obtained in one mass, containing an additional surface, whereon another portion of a whole design, or another entire design, may be engraved. In order to illustrate this, suppose a plate with the design (fig. 5,) engraved thereon, but that it is desired to produce a plate with that design extended, or to make it answer the purpose of a centre-piece, a mould of this plate is obtained, and a plain surface added thereto, as shewn by dots in that figure, when an electrotype copy of the whole being taken, there will be a plate with a plain surface, on which an extension of the pattern, or a border may be engraved.

The fourth head consists, firstly, in the following method:—A flat metal surface is coated with wax or other such matter as can readily be removed. The composition preferred, is one formed of bees' wax, turpentine, and lamp black, mixed together, so as to form a substance when cold, easily cut through and removed; on this surface is traced the required design, and those portions removed down to the metallic plate that are required to print; this may be done with any convenient instrument, one resembling an engraver's etching point, for instance; but when large pieces of the composition are to be removed, a broader instrument may be used, as for instance, a chisel. This done, with a brush or otherwise, plumbago or other substance that will make it a conductor of electricity, is to be rubbed over the composition, and the whole placed in the

solution and in connection with the battery, or single cell apparatus, when the metal will be precipitated, and the composition being melted away or otherwise removed, form the required printing surface. If it be required to produce an embossing surface, the process will be precisely the same, except that for the same pattern, those portions that were for a printing surface cut away, must now be left, and *vice versa.* If it be desired to produce a printing or embossing cylinder, after this plan, the same course is to be pursued, excepting that a hollow cylinder instead of a flat plate is to be used, formed, by preference, in three segments; which, after they have been prepared as above, are joined together and confined in that position by means of flanges or clamps, as shewn at fig. 18. The metal being precipitated within the cylinder, may be afterwards bored and fitted on a mandril, or otherwise mounted.

Another plan, is to take a stone capable of being eaten away by the application of sulphuric or other acid,—the ordinary lithographic stone for instance, on which is traced the design intended to be produced; and then, by means of varnish, lithographic ink, or other such substance, certain portions thereof are covered, and the surface submitted to the action of dilute acid, when those portions of the stone which have not being covered by the varnish or other such protecting matter, will be bitten or corroded away; the whole is then coated with varnish, wax, or other such protecting matter, and having applied plumbago or other conducting substance thereto, it is placed in the solution in connection with the battery.

The difference in the surface for printing or embossing, will depend upon whether the design is removed, or those portions which lie between it; and in this as well as in the former case, the face of the surface may be slightly ground if required.

Another mode adopted, (for obtaining printing surfaces in relief,) is to take a piece of sheet lead or other soft metal, and cut or punch out the required design through the same; after which, it is placed on a flat piece of metal, in which position it must be held firmly; and the mode preferred for doing this, is to tin the two surfaces, and having brought them closely together, apply heat, by which means they will become soldered together; the whole is then properly stopped out and submitted to the voltaic action, when the metal will be deposited, giving the required printing surface in relief.

In order to produce cylinders with relief printing surfaces on this plan, a hollow cylinder is used, similar to that shewn at fig. 18, within which is placed the punched sheet of soft metal. The hollow cylinder, with the punched metal coiled within, being then placed in the solution, and in connection with the battery, the metal will be precipitated, producing a cylinder with those parts in relief which were punched through the soft metal; the portions of the hollow cylinder are then removed, and an axis fitted to the precipitated metal in any ordinary manner; and having done that, the whole may be placed in a lathe and turned true to the said axis, the sheet of lead or other soft metal being melted away by the application of heat, or otherwise removed.

In order to practice the next head of this invention, two moulds of a whole design are obtained, in which it will of course be in relief; then with a scraper or other tool, those portions of the design are to be removed on one plate, which would print the red colour, for instance; and on the other, those portions of the design which would print the blue colour; and this being done, electrotype copies are again obtained,—the one possessing the printing portions which are deficient in the other, and *vice versa;* and

suitable register marks being kept, as is well understood, the design will be printed with the utmost accuracy; and in this manner any quantity of plates may be produced to work together.

In forming blocks or those surfaces which print from raised portions, two moulds of the original engraving are obtained, and in one are filled up or stopped out those cavities in which the metal would be deposited for printing the red colour, and in the other those which would print the blue colour; so that when the moulds are placed in the solution, and in connection with the battery, the raised surfaces will be deposited in the one which are deficient in the other.

The next head consists in producing dies for embossing or impressing horn buttons, by precipitating metal through the agency of voltaic electricity, upon suitably formed moulds or matrices, which may be produced in a variety of ways, dependent upon the nature of the design, the will of the manufacturer, or other causes.

Suppose that it is desired to obtain a plate or block containing several dies, as is now usual in the horn button manufacture, one die is engraved or otherwise produced containing the required device, as at fig. 19; which is then placed in connection with the battery, or in a single cell apparatus, as is well understood, and the metal precipitated upon it, as shewn at *a*, fig. 20, which having acquired a sufficient thickness, is removed, and another copy obtained, until the required number is produced; they are then mounted, in order that they may be applied together when in use; and this may be effected in the following manner:—

Fig. 21, represents, in section, a strong block or plate of metal, having cavities *b*, *b*, formed therein, suitably for receiving the copies of the original device; and should it be required at any time to remove one or more of them,—

this may be done by introducing pins through the apertures *c, c*; and if desired, a loose disc of metal may be placed between the dies and plate, in order to protect them from injury while being removed. Fig. 22, represents, in section, a plate or block of these dies ready for use.

Fig. 23, shews another plan of mounting the dies. The dies *a, a,* are in this case placed firmly in contact with an even plate or block of metal *d, d.* They may be kept in this position by means of solder, which can be afterwards loosened by heat or by other convenient means; the metal is then precipitated, as shewn at *e, e,* and the action may continue until enough is deposited to allow of the back being made even without cutting through the design, when the dies and last deposited metal are to be removed from the plate *d, d,* the whole being firmly united together. Should it be desired in this case to provide for the removal of the dies, they should be turned or otherwise brought to a mechanical surface, previously to being attached to the plate *d, d,* which will prevent an adhesion with the last deposited metal; but if it be desired to obtain the whole, firmly combined together, then the dies should be applied to the plate *d, d,* as they come from the first process. Several other modes of mounting the dies are shewn, but as the patentee does not confine himself thereto, we have not thought it necessary to describe them.—When only one die is used, the patentee prefers mounting them as shewn at fig. 24.

When copying a plate having a number of concave dies already engraved or otherwise executed upon it,—it will be necessary to make a mould or matrix of the same, previously to forming the plate intended to be used, which mould or matrix may be formed by any of the usual methods known; for instance,—by depositing metal upon it by means of voltaic electricity, or when the original would

be injured by such operation, or where speed is required, by taking a cast in wax or other suitable substance; and the plate of dies being obtained, either together or in parts, they are to be treated as above described, either by letting them into a plate, having recesses formed therein, as at fig. 21, by the mode described under fig. 23, or by any other convenient means; and in some cases, the manufactured buttons themselves may be the moulds from which dies are to be produced; but in this and all other cases where non-conductors are used, it will of course be understood that they must be made conductors by the application of plumbago or other substance, commonly used for such purposes. For flat buttons, the process is precisely the same.

The seventh improvement, viz., the mode of mounting seals, bookbinders' tools, and other such instruments, consists in causing the precipitated copy of the design to attach itself in the act of deposition upon the holder of such precipitated copy, instead of being attached thereto by subsequent soldering, as is now practised. Fig. 24, represents a mode by which this may be done singly. *m*, represents the mould containing the design intended to be copied. It is supposed in this case to be of metal. Against this die is placed the holder *n*; and after they are brought closely together they are kept in that position by means of passing cement around the edges, as shewn at *o, o*; or the two pieces may be held together by a clamp. The parts not requiring to be deposited in are then stopped out, and the whole placed in the solution in a single cell apparatus, or in connection with the battery, when the metal will be deposited, as shewn at *p, p*; and if the inside of the holder be previously dipped in dilute nitric acid, it will firmly adhere thereto; or the holder may be made with a groove within, in order to retain the precipitated metal.

A mode of effecting this, when large quantities are made, is shewn at figs. 25 and 26. Fig. 25, is a side section, and fig. 26, a cross section of the same. It is supposed here, that a flat plate is procured, having a number of designs thereon, which plate may be an electrotype copy, produced from an engraved plate, or made in the same manner as the plates of dies, described under the sixth head of the invention. Against this plate *q*, the holders *n*, *n*, are placed, and held in that position by means of the binding screws *r*, *r*, working in the bar *s*, *s*, attached to the vessel *t*, *t*, which contains the metallic solution, say sulphate of copper; *u*, *u*, is a plate of copper, also carried at each end by the vessel *t*, *t*, which is filled with the solution, up to the dotted line. To the bar *s*, *s*, is connected the positive pole of a voltaic battery, and to the plate *u*, *u*, the negative pole, when the parts being suitably stopped out, the metal will be deposited, as shewn in the drawing at *p*, *p*.

Fig. 27, shews another modification, wherein the metal is caused to be precipitated on the outside of the holder. To effect this, the precipitation should be allowed to go on without the holder for some time, as shewn at fig. 28, when the holder is to be placed in contact with it, and the precipitation continued, which will produce the modification shewn at fig. 29.

If thought desirable, the metal may be merely precipitated on to rings, as shewn at fig. 30, and attached to pieces similar to those shewn in the figures, as holders. Precisely the same arrangement is proposed for bookbinders' or other tools used for embossing or impressing.

The last improvement, viz., that of producing seals for impressing, consists in the setting up or putting together moulds of portions of such seals. To effect this, a set of initials, for instance, are procured, similar to ordinary type, as shewn at fig. 31; and these are placed together according

to the required seal, as at fig. 32, placing blank pieces *v, v*, at the sides, in order to obtain a sufficient margin; they are then placed in the metallic solution, and the metal precipitated upon them, as shewn at fig. 33; which precipitated metal may be deposited according to the former improvement, or may be mounted in the usual way.

The patentee concludes his specification in the following words:—

First,—I claim the production of a surface suitable for printing, embossing, or impressing one perfect or connected design, by joining together moulds of a portion or portions of the said design, and then precipitating metal upon them through the agency of voltaic electricity. And I claim, separately, under this head of my invention, the mode described of obtaining flanges to the precipitated moulds.

Secondly,—I claim the mode hereinbefore described, of joining together engraved or otherwise executed printing or embossing plates.

Thirdly,—I claim the joining of plain surfaces to the moulds of engraved plates, and then precipitating metal upon them through the agency of voltaic electricity.

Fourthly,—I claim the modes hereinbefore described, under the fourth head of my invention, of producing surfaces suitable for printing, embossing, or impressing.

Fifthly,—I claim the removing from moulds of plates portions of the design thereon, or in the case of blocks, filling up or stopping out portions thereof, in order to produce plates or blocks suitable for printing in various colours.

Sixthly,—I claim the application and use of moulds formed by the precipitation of metal through the agency of voltaic electricity, for the purpose of embossing or impressing buttons formed of horn, hoof, or tortoiseshell.

Seventhly,—I claim, in producing seals for impressing on wax or other substance, and bookbinders' or other such tools for impressing, the precipitating the metal, through the agency of voltaic electricity, upon the manufactured holder, or a portion thereof, at the same time that it is deposited upon the mould forming the design of such seal or tool; and—

Lastly,—I claim the setting up of moulds, forming a portion of the design of an intended seal, and then precipitating metal upon them, through the agency of voltaic electricity.—[*Inrolled in the Rolls Chapel Office, June,* 1841.]

To Alexander Jones, *of King-street, London, engineer, for improvements in the manufacture of copper tubes and vessels.*—[Sealed 14th January, 1841.]

The object of this invention, is to produce pipes, boilers, stewpans, or other vessels of copper, through the agency of voltaic electricity; in order to effect which, the patentee moulds or otherwise forms the required figure of the vessel in clay, wax, plaster, or other the like substance; or of lead or other metal, fusible at a lower temperature than copper; which mould, if it be of the former class of substances, that is, a non-conductor of electricity, is to be made a conductor by coating it with a solution of nitrate of silver, and then precipitating the metal by means of protosulphate of iron or phosphorous, either in solution or vapour; or the same may be done by the application of plumbago or bronze powder; but no claim is made to any of these modes respectively. The thus prepared mould is then to be placed in a solution of a salt of copper, (the sul-

phate by preference,) and around it a sheet of metallic copper; to the mould is then attached a wire, in connection with the positive pole of a voltaic battery,—and to the surrounding sheet of copper, one in communication with the negative pole, when metallic copper will be deposited upon the surface of the mould: and, on a sufficient thickness being acquired, it is removed from the solution, and either by mechanical force or heat, depending upon the nature of the material, the mould is separated from the deposited metals, which will then constitute the required vessel.

Another part of the invention relates to the joining together of several pieces, so as to form vessels; and by which means stop-cocks, or other such parts, may be added to boilers, &c., formed by the above process. In order to effect this, the parts intended to be joined are varnished or otherwise covered with a non-conducting substance, to within a short distance of the edges to be joined; they are then brought nearly together, placed in the solution, and connected with the battery as before, when the copper will be deposited between the pieces, and form a tight junction without the application of solder.

The patentee claims the forming of vessels, consisting wholly of copper, precipitated or thrown down, by the agency of voltaic electricity, upon moulds not intended to constitute a portion of the said articles when finished, they being removed therefrom by melting or otherwise, as above described. He also claims the mode of joining several pieces together, so as to form tubes, boilers, stewpans, or other vessels, as above described.—[*Inrolled in the Inrolment Office, May,* 1841.]

To James Roberts, *of Brewer-street, Somers-town, in the county of Middlesex, ironmonger, for improved machinery or apparatus, to be applied to the windows of houses or other buildings, for the purpose of preventing accidents to persons employed in cleaning or repairing the same; and also for facilitating the escape of persons from houses when on fire.*—[Sealed 8th July, 1840.]

This invention consists of three distinct constructions of machinery; the first is adapted to windows when they require cleaning or repairing on the outside, in order to prevent the possibility of the person falling who may be employed in such operation.

The second construction, is a portable apparatus; by means of which, communication may be made from the ground through a window with persons in a house on fire. This apparatus is a system of jointed rods, connected on the principle of what is commonly called the "lazy tongs;" and when put into operation, raises a strong hook, fixed at the end of the system of rods, into any window of the house, and by taking fast hold of the window sill, holds the apparatus securely, allowing persons either to ascend or descend by it, as a ladder; or by means of a basket, attached to the end of a rope passed through a pulley, affixed to the top of the apparatus, enables persons to be assisted in their descent without the least danger of falling.

The third construction of machine consists of a compact apparatus for facilitating the escape of persons from houses when on fire, and may be contained in a dressing or other table, generally placed in bed-rooms. When this fire-escape is required to be used, the top of the table is raised or taken off, and the apparatus applied to the inside of the

window, against the sides of which it is readily secured; and persons may, with the greatest safety, be lowered to the ground, or may be raised therefrom by parties below, in order to assist in rescuing the inmates or the furniture of a house.

The apparatus for cleaning and repairing windows, is a rectangular open box, shewn in vertical section at fig. 1, Plate V., and in horizontal section at fig. 2; under which box is to be attached a bracket frame, as seen in fig. 1. The bracket frame has two side bars *a, a,* connected by a rod at the outer part, and the inner extremities of these bars are formed as hooks *b, b,* which are intended (when in use) to be attached to eyes or hooks, fixed into the sill of the window; and *c,* is a rail of wood, connected to the under part of the frame, which is intended to bear upon the sill of the window, as represented at fig. 1.

When this frame has been so affixed to the window sill, the box *d, d,* is to be placed upon it, when two studs, with eyes *e, e,* upon the upper sides of the bars *a, a,* will pass through holes in the bottom of the box, and the box will be firmly attached thereto by means of springs *g, g,* with bolts *f, f.* The upper side of the box *d,* being then raised upon its hinges, a person may safely stand upright in the box to clean or repair the windows, being securely supported by the bracket below; and when the work is done, the spring-bolts being withdrawn, the box may be readily removed from the bracket; and the bracket being unhooked may be placed within the box, and the whole carried away without difficulty.

The second machine is a portable combination of levers, on the principle as before said, of the "lazy tongs." Fig. 3, represents the machine closed, and in a condition to be carried by a fireman to any situation where it may be required; and fig. 4, represents a fireman, who has raised the apparatus against the side of a house.

The rod or bar *a*, is the handle by which the combination of levers, called "lazy tongs," may be expanded or collapsed, the fellow rod or bar *e*, constituting the standard or fulcrum. On placing the end of the lever *e*, upon the ground, and forming a resistance by the foot of the fireman, (which may be aided by inserting the end a little way into the ground,) the fireman will be enabled, by his left hand, to hold the top of the lever *e*, securely, whilst, by his right hand, he depresses the lever *a*, which will cause the reverse end of the apparatus to be raised; and the hook *b*, at the top of the last lever, which turns horizontally on a swivel, may, by these means, be projected into the window of a house, and thereby the apparatus be suspended. A pulley *c*, attached to the upper lever, just under the hook, carries a rope, and when a proper purchase is obtained, a basket or other receptacle may be thereby raised to receive a person desirous of escaping from the window. A sector ratchet rack *d*, is attached to the lever *a*, passing through a socket formed on the side of the standard *e*, and a click taking into the ratchet, prevents the levers from collapsing, and retains the apparatus at any altitude to which the fireman may have raised it; and when it is properly secured, any person can ascend or descend as up and down a ladder.

It should be observed, that the lower end of the standard *e*, is furnished with a stirrup or iron, into which the fireman places his foot, so as to steady the apparatus.

The third improvement is represented at figs. 5, 6, and 7. This construction is made compact, and placed in a bed-room or dressing-room table, in order to be available at a moment's notice. Fig. 5, represents a horizontal view of the apparatus enclosed in a dressing table, the lid or top being removed; fig. 6, is a side view of the apparatus, with a section of the window and wall of the house; and fig. 7,

represents a vertical section of the table and apparatus. *a*, *b*, *c*, *d*, is a rectangular iron frame, forming the entrance of a canvas or net tube. The canvas *e*, is connected to this frame by sewing or otherwise. The lower rail *a*, of the iron frame-work is elongated, and in length is made about equal to the width of the window, for the purpose of preventing the apparatus from shifting laterally when laying in the window frame. This rail is furnished with two bent pins *f*, *f*, projecting downwards, which are intended to fall into holes made in the window sill, for the purpose of steadying the apparatus and preventing it from shifting when in use. The upper rail *b*, is secured by rivets, cords, or in any convenient manner, to a long horizontal rod *g*, *g*, which is some inches longer than the window is wide, and extends across the framing when brought into use. The apparatus is connected to the table by chains or bands *h*, *h*, attached to an iron rod *i*, fastened to the back of the table, by screws or otherwise.

When the apparatus is required for use, the canvas sacking is thrown out of the window, and gradually lowered to the ground by the cord *j*, *j*, which is attached to the bottom of the canvas; and the pins *f*, *f*, being placed in the holes formed for them in the window sill, the upper horizontal bar *g*, *g*, is brought into contact with the window framing, as seen in the figures, which renders the apparatus secure. Then any person, by the help of the knotted rope *k*, *k*, may easily descend or may be gradually lowered in the canvas tube, by means of the rope *j*, *j*. If required, a ladder made entirely of rope, or of rope with wooden spokes, may be adapted to the inside of the canvas tube; or a flexible ladder, made of metal rings about six inches in diameter, and connected together by short pieces of rope or cord, may be employed.

When the apparatus is not in use, it is to be packed up

and placed in the table, when the several parts will come into the position, shewn in fig. 5. If necessary, net-work may be placed over the canvas tube, in order to strengthen it, and as the combustible materials, of which the apparatus is composed, are liable to destruction, if unprotected, or injury from fire, it is desirable to saturate them with a solution of alum or some other anti-combustible material.—[*Inrolled in the Rolls Chapel Office, January* 1841.]

Specification drawn by Messrs. Newton and Berry.

To JOSEPH ATKINSON, *of Round Hill, near Masham, in the county of York, farmer, for his invention of improvements in thrashing and winnowing machines.*—[Sealed 7th March, 1840.]

THESE improvements in thrashing and winnowing machines, consist in a novel arrangement of parts for effecting the operations of thrashing or separating corn from its straw, and also for winnowing or clearing it from its chaff and husks.

The thrasher, or that part of the machine which strips or separates the grain from the ear and stalk, consists of a rotary drum or cylinder, furnished with any suitable number of spikes, made of iron, standing radially, or nearly so, round its periphery. This drum or cylinder is mounted in bearings, fixed on the frame-work, and is partially enclosed or surrounded by a semi-cylindrical box or recess; the interior of which is also furnished with spikes, standing in inclined positions.

In Plate V., fig. 1, represents a longitudinal section, taken vertically through the middle of the machine; fig. 2, is a horizontal view, as it would appear when seen from

above, some parts of the covering being removed to exhibit the interior; and fig. 3, is an end elevation of the machine, shewing some of the internal parts; the same letters referring to similar parts in all the figures.

a, a, is the drum, armed with radial spikes, as before mentioned; *b, b,* is the semi-cylindrical recess, by which the cylinder *a,* is partially surrounded. The spikes fixed in this recess are placed obliquely, as represented in the drawing, fig. 1.

The wheat or other material to be thrashed, is placed on the inclined plane *c,* in front of the cylinder or drum *a, a,* and is conducted or fed into the machine under the roller *d,* which prevents the passage of stones. As the drum *a, a,* revolves, the spikes which are fixed therein, drag the wheat or other material forward into the space between the said drum and the recess *b,* where the grain is beaten out or stripped, and separated from the ear by the action of the radial spikes of the revolving drum; the oblique spikes in the concave recess being placed sufficiently close to hold or retain the ear of corn during the operation of beating or stripping it. When this has been accomplished, the grain and chaff will fall down the inclined plane *e,* on to the segmental sieve of wire-work *f,* the meshes or openings of which are sufficiently large to allow of the grain and chaff passing through and falling down into the hopper *g,* below. In passing through the opening at the bottom of the hopper, the chaff becomes separated from the grain by a current of wind, produced by the rotation of a rapidly revolving fan or blower *h,* which drives the chaff and dust away through the opening in the bottom and back of the machine; the grain, from its gravity, falling down on to the inclined shoots *i,* and *k,* as represented in the drawing, at fig. 1.

The straw, as it is brought down on to the sieve *f,* by

the action of the drum *a*, is conducted or cleared out of the machine by a rake. This rake consists of four arms *l*, *l*, *l*, *l*, affixed to a revolving axle *m*. The arms are formed by plates *n*, *n*, *n*, *n*; the outer edge of each of which has a row of blunt teeth. As this rotary rake turns upon its axle in bearings, it rakes or throws out the straw at the opening *p*, as seen in the drawing.

The working parts of the machine are all enclosed in a wooden casing, and the whole is mounted on running wheels *q*, *q*, for the purpose of removing the machine with facility from one situation to another. In figs. 2 and 3, *r*, is the shaft, to which manual or other power must be applied to work the machine. Upon this shaft is mounted a cog-wheel *s*, *s*, which gears into the pinions *t*, and *v*; the pinion *t*, being mounted on the axle of the drum *a*, *a*, and the pinion *v*, on the shaft or axle *m*, of the revolving rake.

The fan or blower, for winnowing the corn, is actuated by a band or strap *u*, *u*, which communicates motion from a small band-wheel *w*, on the axle of the drum *a*, to a band-wheel *x*, on the axle of the fan or blower.

The patentee claims, first, the drum, with pegs or spikes on its periphery, or a series of arms or wheels, with pegs or spikes (which might answer the same purpose) revolving within a segmental casing, furnished also with pegs or spikes, as shewn in the drawing; or a series of bars or ribs, furnished with pegs or spikes, arranged in a similar manner, for the purpose of separating the corn from its ear, in passing through the machine; and also the adaptation and arrangement of the rotatory rake and blowing apparatus, in connection with the spiked drum and its segmental casing, for the purposes of thrashing and winnowing, as above stated.—[*Inrolled in the Petty Bag Office, August*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To James Harvey, *of Bazing-place, Waterloo-road, in the county of Surrey, Gentleman, for his invention of improvements in extracting sulphur from pyrites and other substances containing the same.*—[Sealed 8th July, 1840.]

This invention of improvements in extracting sulphur from pyrites and other substances containing the same, consists in an improved process and novel construction of furnace, by means of which, sulphur is extracted from pyrites and poor ores in a more expeditious and economical manner, than in the furnaces of the ordinary construction. The pyrites or material containing the sulphur, is to be put into pots, shaped as the frustrums of cones, which are placed in the flue of a furnace, and heated by coke, charcoal, or peat, and are to be kept at one regular temperature during the operation. The intensity of the heat given out by the furnace, should be such as to sublime or drive off the sulphur from the ore, without calcining or clinkering the ore, as it would do if the heat became too intense.

In Plate VI., fig. 1, represents a plan view of the improved furnace, some of the parts being removed to shew in section certain parts beneath; and fig. 2, is a vertical section of the same, taken longitudinally through the furnace flue, pots, and chimney. The pots are shewn at *a, a, a,* and may be made of iron, fire clay, or other suitable material. These conical pots are suspended in the flues *b, b,* of the furnace, by resting in circular apertures, cut in the square fire tiles *c, c, c,* which cover the top or roof of the flues. The lower ends of the pots protrude through other circular apertures in the tiles, which form the bottom of the flues and roof of the condensing chamber, as seen in fig. 2. The sides of the flues are constructed of fire-bricks

or tiles erected as walls between the cone-shaped pots, as shewn by dots in fig. 1, and the whole furnace is surrounded by a strong casing of brick-work or stone. The upper ends of the pots *a, a, a,* are closed by covers *d, d, d,* and their lower ends are furnished with a perforated plate or grating *e, e, e,* which supports the material contained in them, but yet allows the sulphur, in a state of vapour, to escape.

The fuel in the furnace at *f*, being ignited, the heat given out from the combustion passes in the first instance along the central flue, as shewn by the arrows in fig. 1, acting upon the sides of the conical pots; and on arriving at the end of the flue nearest the chimney, the heated vapour passes round the two end pots a^1, a^1, where the flue becomes divided into two channels. The heated vapour then proceeds to the right and left, as shewn by the arrows, and returns along these channels to the front, and then round the pots a^2, and finally escapes into the chimney at *g, g.*

In order to conduct this improved process, the conical pots must be furnished with sufficient quantities of pyrites or other ore containing sulphur, such material being broken in pieces about the size of a man's fist, when the heat from the flues, acting upon the ore in the conical pots, will drive off the sulphur in the form of vapour, which, as it cannot escape upwards, finds a vent through the perforated plate or grating *e, e,* at the bottom of each pot, and passes into the chamber A, A, below. This chamber may be made of slate, metal, or any other suitable material, and its bottom should be covered with a stratum of water a few inches deep. The water will attract the sulphurous vapour, and cause it to be condensed at the lower part of the vessel, in the form of flowers of sulphur.

When the charge of pyrites has been worked off by the separation of the sulphur, the furnace must be allowed to

cool, and the conical pots emptied and re-charged, which may be done either in their place in the furnace, or they may be removed from their seats by a crane provided for that purpose. The lids or covers *d, d,* of the pots, must not fit air-tight, but be sufficiently close to admit only a small quantity of atmospheric air, and prevent the escape of any considerable quantity of vapour. The draught through the pots is regulated by the pipe *i,* leading from the condensing chamber, which must be furnished with a cock or valve. By means of this pipe, a very gentle current of air is maintained through the conical pots, and through the condensing chamber; which current is intended to promote the separation of the sulphur from the iron in the pyrites, or the downward sublimation of that or any other volatizable product; and the cock or valve in the pipe must be adjusted, so as to moderate the draught, and prevent the sulphur being burnt. The pure sulphur, when condensed, may be removed from the chamber through the doors *j, j,* and the liquid at the bottom of the cistern may also be removed and converted into sulphuric acid, in any convenient manner.

The patentee claims the improved process of subliming the sulphur downwards into condensing chambers, by the means above described. — [*Inrolled in the Petty Bag Office, January,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To William Palmer, *of Feltwell, in the county of Norfolk, blacksmith, for certain improvements in ploughs.*—[Sealed 11th July, 1840.]

These improvements in ploughs are designed to reduce the friction of draught, to enable the plough to accommodate

itself to any required depth of cutting, and to afford a more certain and accurate means of directing its course.

These objects are effected by dispensing with the sole or slade, and causing the hinder part of the plough to be supported by and run upon a wheel behind the breast, which is mounted upon adjustable bearings, so that by its position, the share may be made to cut into the earth to a greater or less depth, as circumstances or the nature of the ground may require. The draught of the plough is also capable of regulation by the adjustment of the drag chain attached to a peculiar construction of "hake" at the head of the beam. And the coulter is so connected to the beam, that it may be readily set to any depth or angle, according to the required work and direction.

In Plate VI., fig. 1, represents the breast side; fig. 2, the land side; and fig. 3, the plan view of the plough.

A running wheel *a*, of about eighteen inches diameter, is attached by a pin or axle to a saddle iron *b*, from the upper part of which saddle iron, a perpendicular pin *c*, extends, having a worm or screw thread cut round it.

A bridge *d, d*, affixed to the beam and to the handles, has an aperture through which the pin *c*, passes, and the pin with the saddle iron and wheel is held up by a screw-nut *e*, above.

The bracing is a plate of iron, about half an inch thick, having three arms *f, f, f*; the upper two of which arms are securely fixed to the beam and to the handles by bolts, and the lower arm has a long slot in it, through which the axle of the wheel *a*, passes. It will be perceived, that the situation of the breast or mould board of the plough, is immediately before the wheel, and the frame behind it; and that the wheel, by moving in the furrow, keeps the under part of the breast and frame from coming in contact with the ground; and, therefore, a sole or slade is un-

necessary. According to the depth the share is to cut into the ground, so the running wheel *a*, is raised or depressed, by turning the screw-nut at top of the pin.

The "hake" *g*, at the end of the beam, is formed by a frame, which carries two perpendicular pins *h*, and *i*; the one pin *h*, being smooth, the other *i*, having a worm or screw thread cut round it; and *k*, is a socket piece, having an eye to which the draught chain *l*, is attached. Through this socket piece *k*, both the pins pass, and it slides freely upon the pin *r*, whilst the screw pin *i*, holds it in its position. In order, therefore, to raise or depress the drag chain, the screw pin *i*, must be turned round, which will regulate the position of the draught.

The coulter *m*, has a wedge-shaped cutting blade at the lower part, and is cylindrical above, which is inserted into a cylindrical socket on the side of the beam. This socket forms the end of a bolt, passed through the beam, and through two disc plates, and at its reverse end, there is a winch nut *n*, which, being turned, draws the coulter and the discs tight against the beam. This mode of fixing the coulter, allows it to be placed at any desired depth.

The inner disc plate *p*, is loose upon the pin, and is capable of being turned round. It is made thicker on one side than on the other, that is, its sides are not parallel, but of a wedge form; hence, by turning the inner disc plate *p*, round, the direction of the cutting part of the coulter may be varied, so as to suit the angle of direction required.—[*Inrolled in the Rolls Chapel Office, January*, 1841.]

Specfication drawn by Messrs. Newton and Berry.

To JOSEPH LEESE, Junr., *of Manchester, calico printer, for certain improvements in the art of printing calicos, muslins, and other woven fabrics; and in certain processes connected therewith.*—[Sealed 26th, March, 1839.]

THESE improvements consist, firstly, in the application of a simple apparatus or moveable frame-work, upon, over, or around which the pieces of calicos or other fabrics are to be wound or distended, for the purpose of being *washed* while immersed and working in a cistern or tank of water. This frame-work, with the piece distended upon it, is so constructed and arranged, that the piece is pressed against the body of water, forming a resistance sufficient to wash or cleanse the piece in the most effectual manner.

And secondly, in a peculiar arrangement of frame-work and rollers, both in and outside of the dye vats, in that particular process of the art in which the pieces are to be dyed of a dark blue colour, with indigo, called "navy blues;" and in those cases also where a white yellow or other colour having been previously printed upon them, have to be preserved; that is, the printed surface of the cloth protected from all contact and friction during the blue dipping or dyeing process.

This improvement in the above-named department of the art of calico printing, is to be performed by a simple and peculiar arrangement of apparatus, in order to pass the pieces through the blue or indigo vats; and which is to be driven or impelled by machinery, the pieces always preserving a continuous progressive motion, instead of hooking them upon a frame, and dipping them by hand in certain portions at a time, as is the present system of ordinary blue dyers.

By the peculiar arrangement of the apparatus which con-

stitutes this part of the invention, the printed pieces are always made to pass through this blue dyeing process, with the back side or unprinted surface towards the leading or conducting rollers, so that any dragging or smearing of the printed colour or "*resist*," as it is termed, which must otherwise happen if such colour, being wet, rubs against a roller, is entirely prevented.

And thirdly, these improvements consist in a peculiar method of discharging dark or "navy blues." In Plate VI., fig. 1, represents a sectional elevation of a water cistern and frame-work, for washing the pieces; fig. 2, represents a slight modification of the apparatus for effecting the same purpose; and fig. 3, represents the peculiar arrangement of pieces, vats, frames and rollers, for indigo blue dyeing or dipping.

The washing apparatus, as shewn in fig. 1, consists of a cistern *a*, into which the frame *b*, *b*, is suspended by a pivot *c*, fixed in a strong rail or bar, fastened to the sides of the frame, and resting on either side of the cistern; on this pivot the frame is made to vibrate.

There are also attached to the frame a series of rollers *d*, *d*, over which the pieces to be washed are distended; at one end of the frame is fixed a pair of drawing rollers *e*, *e*, to draw the piece through the cistern; these move with the frame, so that where the vibratory or pendulous motion is given to it, any sudden jerk or irregularity in the moving of the piece through the cistern, is prevented.

When pieces are to be washed, (water being admitted into the cistern through the tap *f*,) they are threaded over the rollers of the frame, and drawn through the cistern by the drawing rollers, at the same time the vibratory motion is given to the frame, and the piece, as it moves forwards, is pressed against the water; the amount of this pressure, and the flow of the water against the piece, being regulated

as may be required, by the speed at which the frame is made to move. Should it be found, in any case, that owing to the resistance of the water, the pull upon the piece, in being drawn through the cistern, is too great, the drawing rollers must work only at intervals, that is to say, the piece must first be wound on the frame, which, when filled, must be put in motion till the piece shall be sufficiently washed, then again drawn through the drawing rollers, and thus the frame, being re-filled with fresh cloth, is again to be set in motion.

Fig. 2, is similar to fig. 1, in its principle, as far as relates to the pressure of the piece wound on a frame against the water in the cistern, but the mode of its operation is different, and as follows:—*a*, is the water cistern; *b*, is a frame, which rests in the cistern on four wheels *d*, having flanges to them; at the bottom of the cistern are short iron bars or rails *c*, on which the wheels run, so that the frame may be moved backwards and forwards in the cistern.

When pieces are to be washed, they are drawn through the rollers of the frame by the drawing rollers, and the frame is moved horizontally backwards and forwards, running upon the rails at the bottom of the cistern; the drawing rollers may, with this machine, as with fig. 1, work continuously or at intervals, as may be required.

In fig. 3, *a*, and *b*, are two vats, into which indigo is put, together with such other ingredients as are commonly used by printers and dyers, to prepare it for the purposes of dyeing; where a dark shade of blue is required, these vats must be longer and a little deeper than those commonly in use, the size being entirely regulated by the shade of colour. *c*, and *d*, are two frames, which are to work in the vats, having on them a series of rollers *e*, *e*, *e*, *e*, arranged in a transverse or slanting direction, as in the figure.

At a considerable height above the vats, and directly

over them, in a fixed frame, are placed another series of rollers *f, f, f, f,* slanted the reverse way of those in the vats. The height of these rollers must be so arranged with the speed at which the piece is to move through the vat, that there shall be sufficient time for the piece, after it has passed through the vat, to fix the indigo (which it receives from it) fast upon the cloth by exposure to the air, that it may be oxydized, or, to use the expression common amongst dyers, sufficiently aired before it again enters the vat to receive a fresh coating.

On the ends of one line of these top rollers *f, f,* are fixed small pullies *g*; a universal band *h*, is wound round each and all of these pullies, connecting them together, so that when the first end pulley is put into motion, all the rest are moved by it, and at one uniform speed; or if it is preferred, small bevil wheels may be substituted for the pullies. A single vat may, by this arrangement, be used; the necessity of using two vats together being regulated by the depth of the shade of blue required by the size of the vats, or by the nature of the colours which are printed upon the pieces to be dyed; for instance, where these colours require to be passed through lime water before they are entered into the blue vat, or where the first vat, into which the piece is entered, requires a greater proportion of lime than the second,—then, in both these cases, two vats must be used together; or in case the piece is required to remain only a short time in the lime mixture, previous to its entry into the indigo vat, then a small cistern *i, i,* must be fixed over the vat, as in fig. 3; and the piece having passed once or twice through it over the first or second pair of rollers, continues its progress onwards into the indigo vat.

There is also another advantage in working two vats together;—where a quantity of cloth has been dyed, and the amount of indigo in them consequently reduced, one

of these vats may be re-set, and have fresh indigo put into it, whilst the other is weak, and thus a greater uniformity be obtained, both in the shade of blue and the speed at which the piece passes through the vats.

When pieces, previously printed, are to be dipped, they are either wound on a roll, or plaited down and laid on a board, placed over the middle of the vat in which they are to be dyed; immediately over them is a wooden shed or cover *k, k,* to keep them dry and protect them from the droppings of the wet pieces, as they pass over the rollers above. The piece is entered into the vat with the unprinted surface to the rollers, and passing under the two first rollers, receives a coating of indigo; it is then drawn out of the vat in the direction of the arrows, to be exposed to the air, by the two rollers in the frame above, corresponding to those in the vat. It then re-enters the vat by the second or next pair of rollers; is again exposed to the air, and so continues to move forward till all the rollers have been passed over in the manner shewn in the drawing.

When working two vats together, the piece, after it has run through all the rollers, will be found to have passed from the middle of the first to the middle of the second vat, where it is drawn through a pair of drawing rollers *l, l,* and wound on a roll *m,* or plaited down, if preferred; the piece is then taken to be scoured, washed, &c., and prepared for the market.

Before stating his improvement in the method of discharging dark or navy blues, the patentee describes a process known amongst printers and dyers, by which pieces that have been dyed with indigo can have a white discharged upon them; the plan and materials employed for this purpose being the following:—

When a piece has been dyed blue, and it is wished to produce a white object upon it, the pattern is printed either

by a block or printing machine, with a colour made from bichromate of potash dissolved in water, and thickened as may be required with flower or gum; the strength of this solution being regulated by the depth of blue shade to be discharged. After the piece has been printed with the above colour, it is passed through a cistern, filled with a solution of oxalic acid and water; the strength and quantity of the acid, per gallon of water, depending upon the depth of the blue to be discharged. It is however, found, that when a tolerably strong solution is used, (stronger than is actually necessary to produce a white,) a much more perfect white is produced; and that the edges of the solids that form the pattern do not float, or bleed, or run, or lose their smartness and clearness, as much as they would if a weaker solution were used in this process; however, though the solution of acid be strong, the work in many patterns is not so sufficiently clear as to be considered perfect. After the piece has passed through this acid liquor, it is entered into lime water, or a weak solution of potash or soda, to clear the whites; and is then washed up, finished, &c. Now, the objections to this mode of procuring a white upon a dark blue ground, and the reasons perhaps why it is not more generally adopted, are, first, that the expense of the oxalic acid required is so great, that the same effect may be more cheaply produced by using a resist; this resist being printed upon the cloth previous to its being dyed in the blue vat; and also the difficulty of procuring a smart and correct impression of the pattern, owing to the flushing and swelling of the discharge.

By the patentee's improvement, both these objections are said to be obviated, by subjecting the piece to a very intense heat, suddenly and immediately after it has passed through the oxalic acid solution; for this purpose, a stove, strongly heated by fire, answers the best; but steam heat

may be used, by passing the pieces over a row of steam chests, and also by causing several jets of steam from pipes, bored with small holes, to blow upon it; both these plans will answer, but not so effectually as the stove heat; by this plan a very clear and excellent discharge is produced, and with a smaller quantity of oxalic acid than would be otherwise necessary.

The patentee claims, as his invention,—firstly, the peculiar application and arrangement of the apparatus described and shewn in the drawings, for washing the pieces, goods, or fabrics; secondly, the novel arrangement and construction of the apparatus, shewn also in the drawings, and herein particularly set forth, for the purpose of dyeing plain or printed pieces, goods, or fabrics, with indigo, without in any way being confined to their precise respective dimensions, or to any of the materials to be employed in their construction;—and, lastly, the method of discharging blue colour from calicos or cloths, by the application of heat as above described.—[*Inrolled in the Rolls Chapel Office, September,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To ELIAS ROBINSON HANDCOCK, *of Birmingham, in the county of Warwick, Esq., for his invention of certain improvements in mechanism, applicable to turn-tables, for changing the positions of carriages upon railroads; which improvements are also applicable to castors for furniture, and other purposes.*—[Sealed 28th December, 1840.]

THE object of this invention is to relieve the friction of pivots and axles generally, and the patentee has described

it,—firstly, in connection with the circular plates of rail-roads, technically called " turn-tables," on which the carriages are turned half round when required to be passed on to other parallel lines of rails; secondly, as applied to castors for furniture; and thirdly, to the axles and wheels of carriages; observing, also, that it is applicable to a great variety of other situations for relieving axle friction.

The novel features are stated to consist of three particulars,—firstly, the introduction of anti-friction rollers; secondly, a mode of supplying and retaining oil or other anti-attritious matters; and thirdly, arranging and supporting vertical axles. The manner in which these objects are carried out, will be understood by referring to the following figures:—

Plate VI. fig. 1, represents the vertical section of a turn-table. The pedestal *a, a, a,* is firmly fixed in a pit under the railway; the table *b, b,* is circular, its top being coincident with the plane of the railway. It has a central pivot *c,* bearing on the top of the pedestal upon which it turns. The box *d, d,* is a tube embracing the upright part of the pedestal, and is attached, by a flange and arms, to the under part of the turn-table. The construction of the pivot *c,* which is of steel, and the hollow at top of the pedestal with the steel block *e,* in its centre, that the pivot turns upon, constitute one of the improvements in the turn-table.

Another improvement, is the introduction of loose collars *f, f, f, f,* round the upright part of the pedestal, called by the patentee rollers, which prevents the table from vibrating as it turns round, and relieves the friction of the tube *d, d.* The arrangement of the flange *g, g,* extending from the box, and its connection with the arms *h, h, h,* which support the table, as shewn in the figure, are also considered as a feature of novelty.

The mode of supplying and retaining oil to relieve the

friction of the rubbing surface, is by cutting small interrupted grooves in the tube, along which the oil will be enabled to flow in small quantities, to afford lubrication.

The novel construction of castor, is shewn at fig. 2, which represents a vertical section of a socket castor. *a, a,* is the socket; *b, b,* a tube in the bottom of the socket; *c,* a central pin, to which the horns *d, d,* of the castor are affixed, that carry the axle of the roller *e.* The upper end of the pin *c,* is pointed, and of steel, working in a conical recess, also of steel, at the upper part of the tube *b.* A long collar *f, f,* is placed loosely upon the pin to prevent lateral friction; it has a flange at its bottom, and is kept in its place by screwing up the piece *g.*

In the event of constructing a castor without a socket, the flange of the tube would be extended, to form a plate to be screwed to the foot of the piece of furniture.

By another modification, the point of the central pin may be downwards, and the anti-friction collar reversed; the tube being affixed to the horns, possessing all the same features inverted.

In adapting this improvement to the axles of wheels, the anti-friction collars, (called rollers;) are placed round the axle, and the oil is introduced and retained in short grooves in the interior of the box, or in the collars.—[*Inrolled in the Inrolment Office, June,* 1841.]

To JOHN LOACH, *of Birmingham, in the county of Warwick, brass-founder, for his invention of certain improvements in castors, applicable to cabinet furniture, and other purposes.*—[Sealed 14th January, 1841.]

THIS invention is described, as consisting in " the introduction of a horizontal anti-friction wheel between the

horns and the bottom of the castor, for the purpose of reducing the friction carrying the weight, and more effectually supporting the horns." We should describe it as a collar, placed round the central pin, to receive the friction between the bottom plate of the socket and the horns that carry the roller.

In Plate VI., is a representation of the improved castor, the socket *a*, being in section. The frame of the horns is shewn at *b*; and *c*, is the roller. A pin *d, d*, passing through the bottom of the socket, and through the frame of the horns, connects the two together; the latter of which, turns loosely upon the pin. For the purpose of support, and to prevent friction, a collar *e*, is placed upon the pin, between the socket and the frame of the horns. It is proposed to be of steel, and to run against a steel bearing at the bottom of the socket.

Instead of the socket *a*, its bottom may be a flat plate, to be secured to the furniture, the other parts being as described.

The patentee says, he claims the introduction of a horizontal anti-friction wheel, between the bottom of the socket and the horns; which anti-friction wheel bears the weight upon the castor, and supports the horns by the projection, the latter bearing against the periphery of the said anti-friction wheel.—[*Inrolled in the Inrolment Office, July*, 1841.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 50, Vol. XIX.)

Feb. 23, 1841.

William Cubitt, V. P., in the Chair.

"Description of a new mode of Steering, as applied to boats of light draught of water, navigating shallow and rapid rivers."

By Captain Henderson, Assoc. Inst. C. E.

The ordinary method of steering with a single rudder, fixed in the usual manner, will bring a vessel round in about four times its length, upon an axis at the point of union between the dead wood of the vessel and the rudder. It was found desirable for the particular service on the Ganges and Burhampooter, for which the vessel in question was designed by the Assam Company, that great facility should be given for coming round rapidly; to accomplish this, the stem and stern of the vessel are alike provided with rudders, of a form adapted to the curvature of the craft. The stern rudder is considerably larger than the other, and occupies the space usually allotted to the dead wood, which is cut away; a more immediate influence is thus exerted upon the boat. The rudders are raised or lowered according to the draught of water, by means of capstans fixed upon the projecting ends of the shaft of a pinion, which is geared into a toothed rack of peculiar construction, on the back of each rudder post. The effect of this arrangement is, that the centre of revolution is transferred to a point nearer the centre of the vessel, and deviating from the true centre, in proportion to the relative dimensions, position, and figure of the two rudders, and of the lines forward and abaft the vessel, which is thus brought round in little more than its own length.

The vessel, of which a model accompanied the paper, is fitted with condensing engines working expansively, with a pressure of steam of 20 lbs. in the boiler; the cylinders are placed at an angle towards the paddle shafts, and act directly upon the cranks without the intervention of side levers.

"Description of a Coffre Dam used in excavating Rock from the navigable Channel of the river Ribble."

By David Stevenson.

The navigation of the river Ribble being much impeded by natural bars or weirs of sandstone rock, compact gravel, or loose sand, several ineffectual attempts were made to remove these hindrances, and eventually a joint stock company, called the Ribble Navigation Company, was formed for that purpose. Messrs. Robert Stevenson and Sons (of Edinburgh) were consulted, and under their directions the present works were commenced: their plan was to cut a channel in the rock wherever it was necessary, and to remove the gravel and sand by steam dredging, forming at the same time a low rubble wall upwards of a mile in length, for the purpose of directing the course of the river so as to obtain a permanent and straight navigable track for the shipping. The first of these operations is alone treated of in the communication.

About half a mile below Preston, a bed of sandstone rock, upwards of three hundred yards in length, stretches quite across the river; some portions are entirely free from any deposit of sand or mud, and the higher parts are frequently left dry during the summer months. This natural weir exerts such an influence upon the flow of the tides, that neap tides which at twelve miles distance rise 14 feet, are not at all perceived at the quay at Preston.

It was proposed to cut a channel through this bar, 100 feet in breadth, affording an average navigable depth of 20 feet at high water of spring tides. In some places, therefore, the excavation

would be 13 feet 6 inches deep. After much consideration it was determined to make use of a series of coffre dams, as the most effectual and economical mode of proceeding. Their construction may be thus briefly described:—

A double row of wrought-iron bars, 2½ inches diameter, with *jumper* points worked upon them, were inserted vertically into the rock at regular intervals of 3 feet apart laterally, the second row being placed 3 feet behind the front row. When a sufficient number of bars were fixed, a tier of planking, 3 inches thick, with clasps to enable the planks to be fixed to the rods, was placed withinside. The lower edges of the planks were cut out roughly to the inequalities of the rock; they were then lowered, and by means of an iron rod, with a crooked end, those parts which did not touch the bottom were ascertained, and a change in the form made, until the plank rested its whole length on the rock: the lower edge was then bevelled off, and being finally lowered to its place, the plank was beaten down by the force of a heavy mallet, upon an upright piece of wood resting upon the upper edge of the planks; the lower bevelled edge yielding to the blows, sunk into the irregularities of the rock, and thus ultimately, in connexion with the puddle behind it, formed a perfectly water-tight joint. The lower planks being fixed, the upper ones were placed upon them; transverse tie bars were inserted at intervals; and the clay puddle was formed in the usual manner. In order that the navigation of the river should not be impeded, the diagonal stays were all placed inside the dams. These stays had joints at the upper ends, and being slipped over the tops of the iron rods, and kept in their places by cotters, their lower ends could be moved either horizontally or vertically, as the irregularity of the rock required:—as the excavation proceeded, longer stays were easily substituted, by merely removing the cotter, sliding up the short stay, and replacing it by another suited to the increased depth. The sides of the dam were kept together by bars of iron connected to two horizontal wale pieces, 10 inches by 6 inches, placed on the outside of the vertical iron rods. When the dam was thus constructed, the water was

pumped out by a steam-engine of ten-horses power, with two pumps of 12 inches diameter.

The whole of the excavation, which was 300 yards in length, and 100 feet in width, was to be completed with three lengths of coffre dams, so contrived as to include within the second stretch the lower side of the first dam, in order to excavate the rock in which that row of piles was fixed. The first and second lengths have been most successfully executed; the third is now in progress, and the excavation is proceeding very rapidly. The sand-stone rock does not require gunpowder. The total quantity to be excavated is estimated at 31,000 cubic yards; all the stone which is raised is used in the construction of the wall for directing the course of the lower part of the river.

Some doubt existed in the mind of the engineer as to the security of the fastening of the iron rod piles by merely jumping them from 15 to 18 inches into the rock; they have, however, proved to be perfectly firm during heavy floods, when the whole dam has been submerged, and the velocity of the current which was rushing over it was not less than five miles per hour.

This paper was accompanied by two drawings, showing the general arrangement of the work, as well as the details of the construction of the coffre dam.

March 2, 1841.

The President in the Chair.

"On a new form of Railway Chairs and improved Fastenings." By Charles May, Assoc. Inst. C. E.

At the suggestion of Mr. Cubitt, V.P., a series of experiments was instituted at the works of Messrs. J. R. & A. Ransome, of Ipswich, for the purpose of determining the most advantageous form of the chairs, and most secure mode of fastening them upon the sleepers of the South Eastern Railway. The result of these experiments has been to produce the cast-iron chairs, and wooden

treenails as fastenings, which were exhibited at the meeting, and described by the Author.

In the event of a chair breaking, it is desirable that the fracture should occur in such a manner as to prevent any of the loose pieces being thrown into situations where they would interfere with the passing trains; to ensure this, the weakest part of these chairs is across the seat—they are, however, stronger in that part than any other chair now in use. In order to ascertain the proper relative proportion between the strength of the jaw and that of the seat, many experiments were made by varying the forms, and wedging the chairs, until they broke, sometimes in one and at other times in the other part; it was then easy to add so much strength to the jaw as would, without waste of metal, cause the fracture to take place invariably across the seat.

For the purpose of ensuring perfect accuracy of form, with a smooth internal surface, so that wedges of a uniform shape and size might be used, the chairs are cast upon metal cores; the joint-chair has an upper piece, overlapping the wedge, to keep the rail in a perpendicular position, and to prevent the end of it from being thrown up or forced away laterally, if the wedge should accidently be removed. This form of chair was originally planned by Mr. John Harris, the engineer of the Stockton and Darlington railway, where it has been in use about twelve months, giving perfect satisfaction. The rail is so placed in the intermediate chairs, that when it receives the pressure of the wedge, it is held firmly down on the seat, against the lower part of the jaw, and at the upper part against a slightly projecting rib, which bears against the neck of the rail.

The holes for the fastenings are so arranged as not to be in the same line; a large portion of the current expense of the maintenance of way on railroads, arising from replacing the sleepers which have been split by the spikes being driven in the same line in the grain of the wood.

The mode of fastening adopted in this case is, to use treenails of dry English oak, compressed into two-thirds of their original bulk, by being forced under a fly press, into metal tubes, in which

they are placed in a chamber heated to about 180°, where they remain sixteen hours: the pressure upon the body of the treenail (the head not being compressed) is sufficient to materially increase the specific gravity without injuring the fibre, or diminishing the strength of the wood, and it retains the form thus given until it has been driven into a damp sleeper, when the expansion is sufficient to fix it firmly.

The ordinary mode of fastening chairs with iron spikes, has been found disadvantageous, because one blow too many causes a reaction, and frequently loosens them; whilst treenails may be driven to any depth, and the heads subsequently split with small wedges, if necessary.

Rails should be 'keyed-up' so tightly as to ensure security, still leaving a large amount of surplus strength in the chair to resist any shock to which they may be exposed:—with wedges of varying dimensions, the chairs, which are frequently of unequal quality, and carelessly cast, are liable to be brought nearly to the breaking point, and to give way as soon as they are subjected to any additional strain. This has been avoided in the chairs and wedges under consideration, by giving them exact uniformity of dimensions.

The wedges adopted, are of English oak, cut out of square timber, so formed as to drive equally well with either side to the rail, and compressed into five-sixths of their bulk, by the same process as is used for the treenails.

Many advantages will result from this form of chair and wedge, with the treenails for fastening; the time occupied in laying the rails is diminished; the holes for the fastenings may be bored in the sleepers by machinery, at a diminished cost, and greater accuracy of guage obtained at the same time; the required inclination of the rail being given in the chair, no cutting away of the sleeper is necessary; the sole of the chair is fixed horizontally upon the surface of the sleeper, and all of them may be placed accurately in the same plane, thus bringing to bear upon the hitherto roughly executed details of railway engineering, those mechanical contrivances by which the cost is diminished,

whilst the dependence upon the skill and attention of the workmen is avoided; at the same time insuring the accuracy of the line, upon which so large a portion of the economy of working a railway depends.

Specimens of the chairs, wedges, and treenails, accompanied this communication.

Mr. Cubitt observed, that two modes of preparing treenails had been hitherto adopted: one was, by forcing the wood through a steel die, in which case neither the form nor the diminished bulk was preserved, as on leaving the die it swelled nearly to its original size. The other was by passing the wood between rollers: this latter process had been found to cause permanent injury to the fibre of the wood, by crushing the capillary tubes, and consequently depriving it of much of its strength. To the mode of preparing the treenails under consideration, neither of these objections existed. He anticipated many advantages from the use of this form of chair, wedge, and fastening. They would certainly be cheaper, even in the first cost, than the ordinary chairs, fastened down by iron spikes. The usual calculation for a double line of rail was £880 per mile for the chairs, wedges, and spikes. The cost of these chairs, with the compressed wedges and treenails, would be £786 per mile. The price of the compressed treenails for railway purposes, would be £5. 10*s*. per thousand; that of iron spikes was £6. 5*s*. per thousand. The wedges, 2¼ inches square, cost £2 per thousand for each inch of their length, so that those for the joint-chairs, which are 8 inches long, average £16, and those for the intermediate chairs, of 6 inches long, cost about £12 per thousand. Each joint-chair, with wedge and treenails, costs two shillings and tenpence; and the intermediate ones, with their appendages, two shillings and one penny each.

One great cause of expense on railways, was the fracture of the chairs during the laying. He knew an instance where in a length of twenty miles of railway 180 tons of chairs had been

broken, either by wedging or in driving down the spikes. This was in the ratio of one chair in ten. In the ordinary mode, the oak wedges are driven home by a 14 lb. sledge hammer, whereas with the new chair, the compressed wedges and treenails are driven by a light wooden mallet.

Mr. Pim remarked that the wood fastenings used for the chairs on the Dublin and Kingston Railway had been compressed by rolling. He considered the present plan much superior.

Mr. Vignoles corroborated the statement of the cost of chairs of the ordinary construction. On the railways of the north of England oak treenails had been used as fastenings for a considerable period. The plan now proposed presented many advantages, not only in the construction of the chairs, which appeared well designed and excellently cast, but in the form and mode of preparation of both the wedges and the treenails.

In answer to a question from the President, whether the compressed treenails could be applied with advantage in ship building—Mr. Mills was of opinion they could be so employed, provided the fibre was not injured by the process. He believed that sound wooden treenails were better fastenings for ships than iron bolts, and quite as good as copper, whilst by their use the expense was materially reduced. Turned treenails of locust wood were at present preferred to all other kinds.

Mr. S. Seaward understood that, at the Royal Dockyards, treenails which were crooked, as much as three times their own diameter, were preferred to straight ones. He believed that the late Mr. H. Maudslay had constructed some machinery expressly for turning them crooked.

Mr. Hawkins remarked, that the treenails were frequently crooked, because the rending caused them to follow the direction of the grain of the timber. Twenty-two years since, Mr. Annesly took out a patent for building ships without ribs. He used for fastenings, treenails compressed by being forced through steel dies, just before driving them into the planks, so that their expansion fixed them firmly in the planking. He built a vessel of very light construction, the sides of which were formed of five

thicknesses of $\frac{3}{4}$-inch boards, held together by compressed treenails, without any ribs. It had proved very stiff and durable.

In reply to a question from Mr. Vignoles, whether the swelling of the compressed treenails in the ribs would not have the effect of preventing the possibility of the "butt end" of a plank starting—Mr. Mills believed that such an event was of rare occurrence; treenails were subjected more to a lateral strain; they were frequently "backed out" after the planks had been fitted into their places; when the latter were properly bent, they retained their shape, and had no tendency to spring out.

Mr. S. Seaward, in support of the opinion that leaks did occur from planks starting, instanced the "Marquis of Huntly," East Indiaman, which was injured in the Downs, by a collision with another vessel; she proceeded on her way to China, but during the whole voyage out and home forty extra men were employed at the pumps. On being taken into dock, it was found that the "butt end" of one of the bow planks had started for 8 or 9 feet in length, and nothing but constant labour and attention had kept the ship afloat, at an additional expense of £7000. to the owners.

PROCEEDINGS OF THE LONDON ELECTRICAL SOCIETY.

Part I.

We regret that our space last month precluded us from noticing the Proceedings of this Society; for we, together with all other lovers of the Sciences, rejoice in the birth of those institutions which tend in any way to dispel the mist still hovering over "Nature's laws." That the Electrical Society will, in some measure, aid this useful pursuit, we cannot for a moment doubt, nor will our readers, if they refer to Part I. of the Proceedings now published.

A letter from Thomas Pine, Esq., on "the effects of vegetable

points on free electricity, and the position they thus occupy in the economy of vegetation," is a well written and interesting paper, setting forth the intimate connection between electricity and the increase of vegetation; and although there is not any thing which particularly strikes us as novel, yet there is merit in collecting facts which, although considered individually, might not strike the reader as remarkable; but being brought collectively to bear upon even crude ideas, may be of considerable importance to science in making clear the way for very interesting practical results.

"Description of a constant acid battery, constructed for the electrotype process, with general observations on electrotype manipulations, by Charles V. Walker, Esq.," Hon. Sec., is a paper which will be useful to that large and still increasing class of experimenters in this new art.

Descriptive memoir of an atmospheric electrical apparatus, (with engravings,) strongly reminded us of a certain Artificial Rain Company, so lately presented to the public by a very popular author; but on more closely examining this paper, we find it perfectly harmless as regards such a hoax, and merely the vehicle for showing the powers of the writer in describing scenes which have not long been disclosed to mortal eyes The atmospheric apparatus is an insulated wire, suspended in the air, fastened at its ends to the steeples of two churches, at Sandwich, and the philosopher elated with the expectation of a dreadful storm, mounts his little garret, impatiently waiting for the sight— we dare not mar it, therefore we subjoin his words:—" The scenes enacted by this apparatus, during great storms, are occasionally distinguished by a magnificence and interest which nothing short of occular demonstration can serve to pourtray." " When the gathering storm cloud, pregnant with infuriated lightnings, and momentarily gaining additional sublimity from reverberated peals of deafening thunder, lingers over the line of wire and deluges the earth with rain, or batters its beautiful foliage with unrelenting showers of hail, then tremendous torrents of electric matter, assuming the form of dense sparks, and

possessing most astonishing intensity, rush from the terminus of the instrument with loud cracking reports, resembling, in general effect, the well known running fire occasioned by the vehement discharge of a multiplicity of small fire-arms. Fluids are rapidly decomposed, metals are brilliantly deflagrated, and large amounts of coated surface repeatedly charged and discharged in the space of a few seconds." We cannot conclude this notice without suggesting that the publication of experiments, which tend to nothing, should be carefully avoided.

Scientific Adjudication.

CHANCERY COURT,

LINCOLN'S INN HALL,—AUGUST 6TH, 1841.

MARLING *v* KIRBY.

This was an appeal from an order of the Vice Chancellor, refusing an injunction to restrain the defendant from using machinery alleged to be an infringement of a patent, granted to L. W. Wright, in 1824, for making "solid-headed pins." The counsel retained were the same as on the former occasion, when argued before the Vice Chancellor, an account of which case having been given in our last number, we think this decision will be sufficiently explicit without further preface.*

The Lord Chancellor gave judgment in the following words:— In this case it appears, that some years ago a patent was obtained by a person of the name of Hunt, the object of which is very clearly explained upon the specification, and was for an improved method of making the heads of pins. The mode in which this was proposed to be effected, was (when the wire, which constituted the shaft of the pin, had been cut into proper length,) to

* We are glad to find, that the Lord Chancellor has clearly pointed out the proper jurisdiction of this Court; for, in some instances, (even lately,) by its interference, it has been the source of much annoyance and unnecessary expense, both to petitioner and defendant.

secure the shaft firmly between two pieces of steel, leaving part of the wire projecting at the top. The upper part of this die, as it is called, had a semi-circular half of a sort of basin, or half globular recess, and the operation of making the head was performed by another piece of steel, coming down upon this circular recess which it occupied, with the exception of a little opening, corresponding with the opening upon the top of the die in which the head was to be formed; the end of the wire projected into this second part of the machine, called the "header," by entering a small hole at the bottom, but which hole was of a larger diameter, considerably, than the shaft of the pin,—it was, in fact, of the diameter of the intended head of the pin. The projecting portion of the pin, intended to form the head, having been inserted into this second part of the machine, called the header, a punch was advanced from the interior of this header, which, coming in contact with the projected head of the pin, had the effect of pushing it down,—some call it smashing, some crushing, and various terms have been applied to it: in point of fact, it had the effect of driving the projected head of the pin into this circular recess, so formed, between the head of the die and the lower part of the header; and by means of this pressure formed the head of the pin; which, of course, therefore constitutes one piece with the shaft of the pin.

Well, this seems to have been open to this objection,—that although it formed the head, it being done by the wire being in a space of very much larger diameter than its own diameter, it formed the head by compressing the wire into this recess, and that was found to form a head, certainly of one piece, in itself, but not to make it of a quality which was very serviceable for use. That patent does not appear in that state to have been found available, or to have been acted upon.

A patent was afterwards obtained by the plaintiff; and, no doubt, that patent operated a very great improvement, which does not seem to be disputed, because the same operation has been carried into effect, both by the plaintiff and by the defendant; and the difference consisted in this:—that instead of operating

upon the exposed head of the wire of the pin, so as to form it into the head by compression, and forcing the parts together, which was found not effectual, the whole extent of the wire, contained in one die, and comprised in a tube of the same, or nearly the same diameter with the shaft of the pin, part of the way down, the shaft lower down than the top of the wire before the head was made,—a circular recess was made in this tube; the pressure was applied as before at the top of the wire, but the wire being contained in a tube, very little more than its own diameter, only so much more as to enable it to move within that space, there was no opportunity or means of the wire being bent, or crushed, or smashed together; but the effect of the pressure was this:—that the lower part of the pin was more effectually secured; and the pressure on the upper part of the wire, it having room to move within the tube, was to cause the metal itself to expand, and to expand in the only space left to it for that purpose, namely, this circular recess, formed a short distance from the top of the wire, in the place of the intended head of the pin; and that appears to have been a very great improvement, inasmuch as it formed a head of one entire substance, the metal having expanded, by its own quality, into this recess, and not having any portion of the wire pressed or crushed together; and that is what the plaintiff effected by the die which he used.

The defendant it seems, now, from the description which I last received, and I must say, it received great assistance from those very intelligible drawings which Mr. Wigram supplied me with at last, and certainly gave me better means of understanding than any thing I received before, what the operation is. The defendant, it appears, does this:—he leaves the die very much as it was in Hunt's patent.—The die, properly speaking, that is to say, there is a part of the wire of the pin projecting beyond the head of the die, which in the plaintiff's it does not; then it produces the same effect as the plaintiff produces, but in this way;—the header has also a corresponding recess, a little opening, corresponding with the half opening at the top of the die. The wire also projects into the header; but that opening in the header is of nearly

the same diameter with the shaft of the pin, very nearly the same diameter, therefore, with the tube in the die; so that when the two parts of the machine come together, they form the same opening, for the purpose of the head being made; and there is a tube below, and a tube above, of nearly the same diameter each, namely,—both being as nearly as possible the diameter of the shaft of the pin. The punch is then made to act in the same way, and the two parts of the machine being then together, the punch operates upon this confined wire, (confined not in the die, but in the header itself,) and it is made to expand into that recess, half of which is formed by the die, the other half of which is formed by the header. Now it is quite obvious, that performs the same operation, and it is also clear it is free from the objection which is found to attend Hunt's, because in one and the other the operation is performed by causing the metal to expand, and not by crushing the wire in it. Now, that is beyond all doubt the effect of the improvement, as used by the plaintiff and the defendant.

I will now refer to the specification of the plaintiff, to see how far he has explained that which is the object of his improvement, and the effect which is produced by it. Now, the patent was for a machine which embraced a very great many of these operations, independently of, and in addition to that which I have now described; operations which attend the formation of the pin from its commencement to its final completion.

Now, in the specification, he divides by numbers the different objects he had in the improved machine; the one in question is the fifth. He says, "the fifth is the manner of forming a head at one end thereof;" that describes nothing. It is for some improvement in making the head. He then goes on and describes the use and application of the different parts of the machine, also by numbers; and after he has described the modes in which he lays hold of the wire of the pin, for the purpose of undergoing the subsequent operations, he proceeds in this way:—he says then "hold the pin very firmly between the dies." The dies opening and holding the pin in this small tube so closely

as to be held firmly between the dies. "When the pin is thus secured in the dies, the cam *k*, fig. 3, acts upon the friction roller." All this is merely to describe the means by which the other parts of the machine are put into operation, which is not now the question. Then it states how the heading apparatus is put in motion; and then it proceeds,—"and by driving it forward, causes the steel punch 20, to press the end of the pin wire into the circular recess, seen in the dies at figs. 14, 16, and 17, by which means a part of the process of heading is effected." He therefore explains by drawings that part of the machine to which this refers, and states, that "the wire being enclosed within these dies, and in the small tube which is comprised in the die, the punch operates on the wire so enclosed, and forces it into the circular recess." What benefit there is from that; how it operates on the metal; or why it is an improvement; those who are looking at this specification would have to form an opinion of for themselves; for I do not find in this specification any other explanation of the object of this altered mode of dealing with the wire beyond what I have now stated. He again repeats at the end what he claims as the patent he specifies; what the object is for which he claims it, by repeating again in substance, shortly, what he had before said more at length.—"Fifthly, he claims the invention in the improved construction or method of making the dies, and the employment of two dies."

That is not in question; it is therefore in the improved means of making the dies. The result therefore is this,—that he states "I claim a patent for an improved die;" and he states the mode in which that improved die is used. The improved die is used by enclosing the wire, the whole extent of the wire, in the die, and then, by a punch, operating on the extremity of the upper end of that wire, and the effect of which is to make it fill the circular recess below.

Now, after considering all the parts of this case, and all the evidence before me, having come to the conclusion, that there is enough in this case to prevent me from seeing, with absolute certainty, that I should not be doing justice by granting an injunc-

tion in the present state of the case; and that there is a real question to be tried between the parties, I think I am doing the best for both parties by abstaining from giving any further opinion, or stating more at length the impression which the consideration of the case has made upon my mind. The only ground upon which I investigated this question at all, as it affects the supposed doubts entertained as to the validity of the patent, was to see whether I could, with perfect safety, adjudicate against the defendants, that they were violating the plaintiff's patent; because, if I saw reason for thinking that that was a matter, with respect to which I could not deal with perfect certainty of being right, I should be running great risk of doing a great wrong by interfering with the present situation of the parties before that question has been decided by the only tribunal that has the means of coming to a satisfactory conclusion on the question. I think the rule has been very accurately stated at the Bar; the rule on which I always endeavour to act, which is, not to interfere with the exercise of legal rights before a trial at law, except in cases where I saw it demonstrated there was a violation of that rule of law. I am sorry to think, that a very great degree of mischief and injustice has, at different times, been committed by orders of this Court not keeping sufficiently in view the sphere within which that jurisdiction ought to be exercised. No doubt it is quite possible the Court may be in error on a question of copyright, or patent right, or any of those legal rights, on which it interferes for the purpose of protection, if it prevents one party from exercising the means of making profit by the use of whatever is the subject matter in contest. If it ultimately turns out that that impression of the Court is wrong, it has no means of reinstating the defendant in his proper position; it may not have adequate means, in all cases, of restoring to the plaintiff the position in which he ought to stand; but there is no comparison between the degree of injury done, or the degree of the power which the Court has in correcting any error in the one case rather than the other.

On that ground it is, without expressing any opinion, necessary to shew the general grounds on which the question depends; and

I think I should not be acting with a certainty of doing right, or without great danger of doing wrong, if I were to interfere with the situation of the parties as they at present stand. The action, therefore, must be tried, and the right must be established, before this Court, in my opinion, ought to interfere with what is doing either by one party or the other.

As to that action, the Court having the injunction in its hands, has the power of putting the parties on terms as to the mode in which that question of right is to be decided and tried; and one point undoubtedly is, about which I understand there is no difficulty made at the Bar, that the plaintiff should have access by himself, and those whose assistance he might require, in seeing what it is the defendants are doing; I mean with regard to this particular part of the process. I understand there is no objection made to that.

Mr. K. Bruce,—Not the least.

Mr. Wigram,—It was refused before.

Mr. K. Bruce,—There is not the least objection to it my Lord, and never was.

THAMES TUNNEL.

We have much pleasure in announcing, that this Herculean work is fast approaching completion; the entire excavation has now advanced some distance inland on the northern shore of the river; the perpendicular shaft on the Middlesex side, for foot passengers, is formed in the same way as that on the Surrey side; and its cylindrical casing of brick-work nearly finished. The mode of constructing the shaft is ingenious, and affords the greatest security to the workman, and protection against land-springs.

A strong frame or ring of iron is formed, of the diameter of the intended shaft, which is first laid perfectly level upon the surface of the ground. Upon this frame is built a strong cylinder of brick-work, for the casing of the shaft, which is several feet in thickness; the bricks being of the best quality, solidly laid, and cemented together by a plastic material, which quickly

hardens, even under water. When this cylinder of brick-work has been erected several feet high, and firmly set, the earth within the circle is removed for a certain depth, and the cylinder, with its base ring, allowed to sink gradually. Then a further portion of the cylinder is built; and, after removing the earth to a greater depth within the circle, the structure is in like manner allowed to sink again; and so on, until the whole of the cylindrical casing, to form the internal part of the shaft, is complete; and by the earth within being gradually removed to the required depth, the cylinder is allowed to descend to the bottom. The last few feet of the casing is now nearly finished, and the structure about to be let down to its ultimate resting place.

The shield of the horizontal part of the tunnel, where the excavators are working, has been brought to within about twenty-two feet of the Middlesex shaft, and the masonry of the tunnel completed to that distance. A further tunnelling has also been effected beyond the shield, entirely through into the shaft on the northern bank of the river, so that the passage is now really made under the river, from the Surrey to the Middlesex side. This opening is at present only about five feet high and three feet wide; but it has enabled the engineer, Sir M. J. Brunel, and some of the directors, to pass through; and several ladies even have had the courage to achieve that feat; and so also have some of the members of the Royal Family.

It is remarkable, that since the work has passed beyond the limits of the river on the north side, more inconvenience and impediment has been experienced from the great influx of water from land-springs, than had been before felt in any previous part of the work.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th July to the 19th of August, 1841, inclusive.

To John Haughton, of Liverpool, Clerk, Master of Arts, for improvements in the means employed for preventing railway accidents, resulting from one train overtaking another.—Sealed 30th July.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, gentleman, for improvements in tanning and dressing, or currying of skins,—being a foreign communication.—Sealed 31st July.

Edward Foard, of Queen's Head lane, Islington, in the county of Middlesex, machinist, for an improved method or improved methods of supplying fuel to the fire-places or grates of steam-engine boilers, brewers' coppers, and other furnaces; as well also to the fire-places employed in domestic purposes, and generally to the supplying of fuel to furnaces or fire-places, in such a manner as to consume the smoke generally produced in such furnaces or fire-places.—Sealed 19th August.

List of Patents

Granted for SCOTLAND, subsequent to July 22nd, 1841.

To James Molyneux, of Preston, linen-draper, for an improved mode of dressing flax and tow.—Sealed 28th July.

Edward Foard, of Queen's Head lane, Islington, machinist, for an improved method or improved methods of supplying fuel to the fire-places or grates of steam-engine boilers, brewers' coppers, and other furnaces; as well also to the fire-places employed in domestic purposes, and generally to the supplying of fuel to furnaces or fire-places, in such a manner as to consume the smoke generally produced in such furnaces or fire-places.—Sealed 28th July.

William Crofts, of Radford Works, near Nottingham, lace manufacturer, for improvements in the manufacture of figured or ornamented bobbin net or twist lace, and other fabrics.—Sealed 28th July.

James Shanks, of St. Helens, Lancashire, chemist, for improvements in the manufacture of carbonate of soda.—Sealed 28th July.

Richard Beard, of Egremont-place, London, for improvements in the means and apparatus to be employed for taking or obtaining likenesses and representations of nature, and of drawings, and

other objects,—being a foreign communication.—Sealed 28th July.

John Brumwell Gregson, of Newcastle-upon-Tyne, soda water manufacturer, for improvements in pigments, and in the preparation of the sulphates of iron and magnesia.—Sealed 29th July.

James Lee, of Newcastle-upon-Tyne, chemist, for improvements in the manufacture of chlorine.—Sealed 2nd August.

Moses Poole, of Lincoln's Inn, London, for improvements in tanning and dressing, or currying of skins,—being a foreign communication.—Sealed 2nd August.

Thomas Spencer, of Liverpool, carver and gilder, for an improvement or improvements in the manufacture of picture and other frames and cornices, applicable also to other useful and decorative purposes.—Sealed 4th August.

John Haughton, of Liverpool, Clerk, for improvements in the method of affixing certain labels.—Sealed 11th August.

Thomas Carr, of Newcastle-upon-Tyne, for improvements in steam-engines,—being a foreign communication.—Sealed 18th August.

Ezekiel Jones, of Stockport, mechanic, for certain improvements in machinery for preparing, slubbing, roving, spinning, and doubling cotton, silk, wool, worsted, flax, and other fibrous substances.—Sealed 20th August.

New Patents
SEALED IN ENGLAND.
1841.

To Joseph Ratcliff, of Birmingham, manufacturer, for certain improvements in the construction and manufacture of hinges, for hanging and closing doors,—being a communication.—Sealed 4th August—6 months for inrolment.

Owen Williams, of Basing-lane, London, engineer, for improvements in propelling vessels.—Sealed 4th August—6 months for inrolment.

John Lee, of Newcastle-upon-Tyne, manufacturing chemist, for

improvements in the manufacture of chlorine.—Sealed August 4th—6 months for inrolment.

James Warren, of Montague-terrace, Mile End Road, for an improved machine for making screws.—Sealed 4th August—6 months for inrolment.

Stopford Thomas Jones, of Tavistock-place, Russell-square, Gent. for certain improvements in machinery for propelling vessels by steam or other power.—Sealed 4th August—6 months for inrolment.

William Craig, engineer, Robert Jarvie, rope-maker, and James Jarvie, rope-maker, all of Glasgow, in the Kingdom of Scotland, for certain improvements in machinery for preparing and spinning hemp, flax, wool, and other fibrous materials.—Sealed 11th August—6 months for inrolment.

Samuel Brown, of Gravel-lane, Southwark, engineer, for improvements in the manufacture of metallic casks or vessels, and in tinning or zincing metal for such and other purposes.—Sealed 11th August—6 months for inrolment.

John Seaward and Samuel Seaward, of the Canal Iron Works, Poplar, engineers, for certain improvements in steam-engines.—Sealed 13th August—6 months for inrolment.

William Hale, engineer, and Edward Dell, merchant, both of Woolwich, for improvements in cases and magazines for gunpowder.—Sealed 13th August—6 months for inrolment.

John Hawig, of the Strand, gentleman, and Felix Moreau, of Holywell-street, Millbank, sculptor, for a new or improved mode or process for cutting or working cork for various purposes.—Sealed 21st August—6 months for inrolment.

John Hawig, of the Strand, gentleman, and Felix Moreau, of Holywell-street, Millbank, sculptor, for a new or improved process or processes for sculpturing, moulding, engraving, and polishing stone, metals, and other substances.—Sealed 21st August—6 months for inrolment.

John Thomas Carr, of the town and county of Newcastle-upon-Tyne, for improvements in steam-engines,—being a communication.—Sealed 21st August—6 months for inrolment.

George Hickes, of Manchester, agent, for an improved machine

for cleaning or freeing wool and other fibrous materials, of burs and other extraneous substances.—Sealed 21st August—6 months for inrolment.

Charles De Bergue, of Broad-street, London, merchant, for improvements in axletrees, and axletree boxes,—being a communication.—Sealed 21st August—6 months for inrolment.

Frederick De Moleyns, of Cheltenham, Gloucester, gentleman, for certain improvements in the production or development of electricity, and the application of electricity for the obtainment of illumination and motion.—Sealed 21st August—6 months for inrolment.

William Walker Jenkins, of Greet, in the parish of Yardley, in the county of Worcester, manufacturer, for certain improvements in machines for the making of pins, and sticking the same into paper.—Sealed 27th August—6 months for inrolment.

Edmund Morewood, of Highgate, Middlesex, gentleman, for an improved mode of preserving iron and other metals from oxidation or rust,—being a communication.—Sealed 27th August—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, Middlesex, civil engineer and patent agent, for certain improvements in the means and apparatus for obtaining motive power, and rendering more effective the use of known agents of motion,—being a communication.—Sealed 27th August—6 months for inrolment.

Samuel Hardman, of Farnworth, near Bolton, in the county of Lancaster, spindle and fly maker, for certain improvements in machinery or apparatus for roving and slubbing cotton, and other fibrous substances.—Sealed 27th August—6 months for inrolment.

Thomas Chambers, and Francis Mark Franklin, of Lawrence-lane, London, button-warehousemen, and Charles Rowley, of Birmingham, Warwick, button manufacturer, for improvements in the manufacture of buttons and fastenings for wearing apparel.—Sealed 27th August—6 months for inrolment.

CELESTIAL PHENOMENA FOR SEPTEMBER, 1841.

D.	H.	M.	
1			Clock after the sun, 0m. 10s.
	—		☽ rises 6h. 38m. A.
	—		☽ passes mer. M.
	—		☽ sets 5h. 34m. M.
	1	34	Ecliptic oppo. or ○ full moon
	21	46	Her: in conj. with the ☽ diff. of dec. 4. 58. S.
2	18	10	☿ greatest Hel. Lat. N.
3	10	56	♃ in □ with the sun.
4	5	34	Pallas in oppo. to the ⊙ intens. of light 0.469
5			Vesta stationary
	—		Clock after the sun 1m. 27s.
	—		☽ rises 7h. 37m. A.
	—		☽ passes mer. 2h. 46s. M.
	—		☽ sets 10h. 30m. M.
8	2	13	☽ in □ or last quarter.
9			Occul ε Geminorum, im. 14h. 21m. em. 15h. 19m.
10			Clock after the sun, 3m. 9s.
	—		☽ rises 11h. 58m. A.
	—		☽ passes mer. 7h. 27m. M.
	—		☽ sets 4h. 5m. A.
11			Occul. *Venus*, im. 18h. 30m. em. 19h. 42m.
11	19	50	♀ in conj. with the ☽ diff. of dec. 0. 21. S.
12			Occul. 18 Leonis, im. 16h. 5m. em. 16h. 48m.
	19		☽ in Perigee.
13	7	56	♃'s first satt. will em.
14	22	17	Her. in oppo. to the ⊙
15			Clock after the sun, 4m. 53s.
	—		☽ rises 5h. 53m. M.
	—		☽ passes mer. 0h. 2m. A.
	—		☽ sets 5h. 52m. A.
	6	2	Ecliptic conj. or ● new moon.
	7	32	☿ in conj. with the ☽ diff. of dec. 5. 43. N.
18			Mercury R.A. 12h. 12m. dec. 0. 15. S.
	—		Venus R. A. 9h. 15m. dec. 15. 56. N.
	—		Mars R. A. 16h. 22m. dec. 23. 19. S.
	—		Vesta R. A. 2h. 27m. dec. 3. 12. N.
	—		Juno R. A. 13h. 25m. dec. 2. 12. S.
	—		Pallas R. A. 22h. 27m. dec. 0. 14. S.
	—		Ceres R. A. 1h. 32m. dec. 3. 27. S.
	—		Jupiter R. A. 16h. 45m. dec. 22. 0. S.
	—		Saturn R. A. 17h. 45m. dec. 22. 34. S.
	—		Georg. R. A. 23h. 32m. dec. 3. 49. S.
	—		Mercury passes mer. 0h. 22m.
	—		Venus passes mer. 21h. 27m.
	—		Mars passes mer. 4h. 33m.
	—		Jupiter passes mer. 4h. 55m.
	—		Saturn passes mer. 5h. 56m.
	—		Georg. passes mer. 11h. 41m.
18	0	48	☿ in the ascending node
19	10	50	♄ in □ with the ⊙
20			Clock after the sun, 6m. 38s.
	—		☽ rises, 0h. 40m. A.
	—		☽ passes mer. 4h. 16m. A.
	—		☽ sets 7h. 49m. A.
	11	19	♂ in conj. with the ☽ diff. of dec. 2. 40. N.
	18	30	♃ in conj. with the ☽ diff. of dec. 4. 33. N.
21			Occul *y* Ophiuchi, im. 6h. 19m. em. 6h. 57m.
21	20	48	♄ in conj. with the ☽ diff. of dec. 4. 12. N.
22			Occul *g* Sagittarii im. 6h. 44m. em. 6h. 51m.
22	1	32	☽ in □ or first quarter.
22	17	34	⊙ enters Libra, Autumn commences.
24			Occul Sagittarii, im. 6h. 6m. em. 6h. 54m.
	15		☽ in Apogee.
25			Clock after the sun, 8m. 22s.
	—		☽ rises 4h. 1m. A.
	—		☽ passes mer. 8h. 25m. A.
	—		☽ sets M.
	—		Occul 19 Capricorni, im. 10h. 7m. em. 11h. 21m.
26	6	13	☿ in the descending node.
27	5	59	♂ in conj. with ♃ diff. of dec. 2. 4. S.
29	2	31	Her. in conj. with the ☽ diff. of dec. 4. 53. S.
29			Occul 22 Piscium, im. 9h. 1m.
30	4	17	Ecliptic oppo. or ○ full moon.

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. CXVIII.

Recent Patents.

To Henry Davies, *of Wednesbury, in the county of Stafford, engineer, for certain improvements in engines or machines, to be used for obtaining mechanical power; also for raising or impelling fluids.*—[Sealed 14th June, 1838.]

This invention relates to a class of rotary engines or machines for obtaining mechanical power, and for raising or impelling fluids, in which the chamber has the form of the zone of a sphere, with conical ends, the cones pointing towards the interior of the sphere; and which chamber is intersected by a disc or plate, attached to an axis, placed at such an angle to the axis of the chamber, as to cause a radial line, on each side of the plate or disc, to come in contact with the opposite cone of the chamber.

In order to obtain the most efficient working of these engines or machines, it is necessary that there should always be a perfect contact of the intersecting disc or plate

with the cones of the chamber, at the radial lines above referred to, in order to prevent the passage of steam or other fluid between such disc or plate, and cones, at such lines of contact.

By means of this invention, a more extensive contact is provided by means of teeth or cogs, projecting from each side of the said disc or plate, and forming part thereof; and other teeth or cogs, projecting from the cones of the chamber, and forming part of such cones. These several teeth or cogs being so arranged on the said disc or plate, and cones respectively, that each set takes into gear with the opposite set, in the same manner as the teeth or cogs of bevel wheels, when working together; and they must be so fitted together by grinding or otherwise, as to insure a perfect or nearly perfect contact between them, when in gear.

Descriptions of several engines or machines, of the class above referred to, will be found in the specification of a patent granted to W. Taylor and H. Davies, and a subsequent one to H. Davies. For an account of these specifications, see Vol. XVIII., page 97, and Vol. XIX., page 18, of our present Series.

It will be seen on reference to these specifications, that engines of this class may be constructed either with stationary chambers, or with chambers which revolve on their axes.

The adaptation of this invention to one of these engines or machines, in which the chamber is stationary, and the axis of the plate or disc has the conical rotary motion, is shewn as described in the specification inrolled on the 26th day of April, 1836.

In Plate VII., fig. 1, is a side elevation of an engine, with the improvement applied thereto; fig. 2, is a vertical section of the same; fig. 3, is a plan view of the plate or disc, which is a flat cone; fig. 4, shews it in perspective,

and also part of the lower cone of the chamber. This figure shews the teeth or cogs of the plate or disc, in gear with the teeth or cogs of such lower cone, and the situation of that part of the machine or engine, which in the said specifications is called the "stop" or "piston." Fig. 5, is a plan view of the upper cone and stop or piston; fig. 6, is a vertical section of the upper cone, and shewing the stop or piston; fig. 7, is a section of the lower cone; fig. 8, is a vertical section of the chamber, shewing the stop or piston, and steam passages of the machine or engine, the plate or disc being removed; and fig. 9, is a horizontal section of the chamber, with its steam passages and piston or stop. This figure shows the induction and eduction passages, and the situation of a slide valve, by which the direction or current of the fluid, passing through the machine or engine, may be changed.

A, B, are the two cones of the chamber; C, is the spherical part of the chamber; D, is the stop or piston; E, is the disc or plate; F, is the axis of the disc or plate; G, is the centre ball; H, is the driving wheel, to which the end of the axis F, is connected by suitable couplings at I. The driving wheel H, is mounted in proper brasses, on the axle K, which is secured in the frame-work L. The lower cone A, is not fixed to the chamber, but is fitted thereto by the packings O, O, in such manner as to prevent the escape of fluid. This cone is supported by the shaft M, which revolves in a cup or step, fixed to the frame N. P, P, is a gland, by which the centre ball G, is packed; and this ball is also packed by the brass cup Q, supported by the rod R; and this rod is capable of being adjusted by means of keys or cotters, passed through a slot in the shaft M;—S, is the induction pipe, communicating with the induction box T; U, is a slide valve, within the induction box; *t*, is the induction passage, communicating with the chamber; and *x*, is

S 2

the eduction passage, from the chamber through the slide valve U, to the eduction pipe X.

a, a, a, are the teeth or cogs, upon the upper side of the disc or plate, and these take into gear with the teeth or cogs *b, b, b,* upon the upper cone B, of the chamber. The diameters of these two cogged surfaces are equal, and are equal in pitch and number; *c, c, c,* are the teeth upon the lower side of the disc or plate, and these take into gear with the teeth *d, d, d,* upon the lower cone A, of the chamber. This cone A, is of smaller diameter than the lower side of the plate or disc; and as the proper action of the engine or machine, requires that the several sets of teeth or cogs, which take into gear, should correspond with each other in pitch, the teeth or cogs of the lower cone must be less in number than those of the lower side of the plate or disc.

The cone B, is fixed to the chamber C, but the cone A, is at liberty to revolve; therefore, when the conical rotary motion is communicated to the axis F, and the teeth of the upper side of the plate or disc work with the teeth of the cone B, those of the lower side of the plate or disc work with the teeth of the cone A, causing it to revolve in proportion to the difference in number of the teeth on the lower side of the disc and the cone A.

A slot is formed in the plate or disc, in such manner as to allow the stop or piston to be fixed in the chamber, in the position shewn in the figures 3 and 4, and to provide a communication between the parts of the chamber on each side of the disc. The stop or piston is attached to the upper cone and to the spherical side of the chamber; and although it is not actually attached to the lower cone, yet its lower edge must be fitted to the faces of the teeth upon the lower cone, in such a manner as to obstruct the passage of fluid between the stop or piston and the faces of such

teeth, and yet to allow of the lower cone revolving in the manner before mentioned. The lower edge of the stop should be sufficiently wide to extend over at least two of the teeth or cogs, and the faces of the teeth of the lower cone made of a true conical figure, having the lower edge of the piston to them.

The adaptation of this invention to an engine or machine which has a revolving chamber, and in which the axis of the plate or disc is kept at an angle to the axis of such chamber, by its being supported in a fixed bearing, will be seen by reference to figs. 10 and 11.

Fig. 10, is a vertical section of an engine; and fig. 11, a horizontal section of its chamber. A, and B, are the two cones of the chamber. The cone A, is kept tight to the chamber by the packing and set screws O, O. The cone B, has a projecting ring upon it, which revolves in the bearings Z, Z; and these bearings are supported by a bracket, attached to the frame L, L; C, is the spherical part of the chamber; E, is the disc or plate; F, is the axis of the disc or plate; and G, is the centre ball, which is packed and supported in the same manner as in the engine or machine already described; L, L, is a frame, supporting the engine, and it also carries the bearings I, and N, for the shafts F, and M; the shaft M, is attached to the case W, which forms part of and partly surrounds the chamber.

The steam or other fluid is admitted into a collar S, surrounding the shaft M, and having two distinct compartments X, and T. Y, Y, Y, are stuffing-boxes, fitted to the collar S, to prevent the escape of fluid from the compartments X, and T. The shaft M, is hollow, and has two passages *x*,* and *t*,* as shewn in fig. 10; which passages form the medium of communication between the two compartments X, and T, and the passages *x*, and *t*, surrounding the chamber; one of them serves as an induction passage, and

the other as an eduction passage, as indicated by the arrows. These passages are formed by a case, fitting over the lower cone and spherical side of the chamber respectively, and communicate with the chamber by means of slots. The stop or piston is fitted in the chamber in the same manner as shewn in figs. 8 and 9.

The patentee claims the application of discs or plates, and cones having teeth or cogs upon their surfaces, and forming parts of the same, respectively, in the construction of all engines or machines of the class referred to, for the purpose of obtaining a more extensive contact of the discs or plates and cones in such machines or engines, and preventing or obstructing the passage of steam or other fluid, at the lines of such contact.—[*Inrolled at the Rolls Chapel Office, December*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS ROBINSON WILLIAMS, *of Cheapside, in the city of London, Gent., for certain improvements in obtaining power from steam and other elastic vapours or fluids; and for the means employed in generating such vapours or fluids; and also for using these improvements in conjunction with distillation or evaporation; and other useful purposes.*—[Sealed 15th April, 1840.]

THIS invention consists in different arrangements of machinery for obtaining power from steam or other elastic vapours, in their passage from the boilers, in which they are generated, to the cylinders of common engines; and is also applicable, with nearly the same arrangement, to being usefully employed as a simple, distinct, and separate engine.

These arrangements may be applied to all kinds of boilers or generators; but it is believed will be found most advantageously used in conjunction with the form of boiler hereinafter described.

In Plate VII., A, fig. 1, may be supposed to be the circular top of a common boiler; *a*, is the water line therein. At the top of this boiler is inserted the cylinder B, having two ends C, and D, forming the chamber E, which should be about half or two-thirds the capacity of the cylinder of the steam-engine, with which it communicates by the steam-pipe F. This engine is supposed to be working expansively, and to be furnished with the usual slide valves for that purpose. G, is a wheel, having cycloidal detent teeth upon its periphery; and *b*, is its axis or arbor, supported at its lower end upon a steel point at *c*, secured in the bottom plate D; and the upper end *d*, of the shaft *b*, is made to pass through the upper plate C, and common stuffing-box *e*; *f*, is a small but strong bevilled pinion, fixed upon the end of the shaft *b*, above the stuffing-box *e*, and communicates or transmits the power of the wheel G, to a bevil wheel, which may be of such size as to give any required velocity to another shaft. It will be seen that the bottom end of the cylinder B, is cast of greater thickness than the other parts, forming a rim *i*, *i*, around its lower inside edge, somewhat wider perpendicularly than the thickness of the detent wheel G; the inner side of this rim is to be accurately turned out before the plate D, is screwed to it, so that the detent wheel G, shall be made to fit nicely within it, but without touching in any part.

The description and intention of this will be better seen by reference to fig. 2, where the lower end of the rim *i*, *i*, upon the cylinder, together with the detent wheel G, are shewn in horizontal position, with the plate D, removed. Through this rim *i*, *i*, are a convenient number of very

narrow or rather thin slits 1, 2, &c., (the number and width of which depend upon the quantity of steam intended to pass through them); these slits are cut in a slanting direction, nearly tangental to the periphery of the wheel G, and opposed to its detent teeth; *m, m, m,* are screw-holes, by which the plate D, is attached to the rim *i, i.*

It will now be seen, at fig. 1, that the steam, in its passage from the boiler to the chamber E, and the steam-pipe F, must pass through the slits or orifices 1, 2, 3, &c., in the direction of the arrows, and impinge, with great force, upon the teeth of the wheel G, thereby communicating a high velocity, and great amount of power, before the steam, in the cylinder E, arrives at the same degree of pressure as in the boiler A, and the time again arrives for the slide valve to open for the admission of steam from the chamber to the cylinder of the steam-engine.

It will be seen, that this chamber E, may be made of any required size, so as to become a proper measurer of quantity, for steam to be let into the cylinder of the engine attached thereto, so as to work the steam in it with any degree of expansibility desired. If it be desired to stop the machine attached to the wheel G, this may be done by a clutch-box, situated in any convenient manner.

Besides additional amount of power derived in thus taking advantage of the current of steam in its passage to the engine by this arrangement, another object is also attained, viz.;—by placing the safety-valve H, fig. 1, (or valves,) in connection with the chamber E, instead of immediately in the boiler A, and connecting the pump of the engine, for supplying the boiler with water, to the shaft *h*; whenever the engine is necessarily stopped, and steam may be blowing off at the safety valve, it is at the same time being made use of by its still acting upon the wheel G, and therefore pumping into the boiler.

This the patentee considers will be found of great advantage in locomotive engines, if necessarily delayed, as there is no adequate means of supplying the boiler, except when in motion.

It will be seen, that this arrangement may also be advantageously applied to many other useful purposes, either as a separate engine, and unconnected with any other, by allowing the steam to pass off freely from the cylinder E, after imparting its power to the wheel G; or in distillation, or whenever steam or elastic vapours are necessarily to be raised, no inconsiderable power may be gained by placing this engine in connection or between the still head and the condensing worm, or other means of condensation. Also, when steam is raised or water heated for the purpose of warming buildings, a power may be evidently gained by taking advantage of its current. There are several other modes of taking advantage of this current, such as placing a spiral screw-fan or vanes of metal upon axes in the cylinder E, or the one represented at fig. 3, where A, B, is the steam-pipe, from the boiler to the engine; C, the arbor or axis of a float or detent wheel, enclosed in the case D, forming a part of the square steam-pipe, with a lid or cover on one side. The arbor C, has a stuffing-box at one end; the other end has no need of any, being within the box. The front end, which passes through the stuffing-box, carries a pinion, as in fig. 1; but the arbor being horizontal in this case, a spur-wheel pinion is used, communicating with another large spur-wheel, upon a shaft, conveniently placed for carrying the power to be applied to any useful purpose.

But none have been found to succeed so well in practice as that described under fig. 1, or as it is again represented in connection with the boiler at fig. 4, in which A, B, represents a long bent tubular boiler, extending from the manhole 1 to 2, where it terminates above the brick-work in

the steam-chamber C, enclosing the apparatus or engine D, similar to the one represented in fig. 1, adapted there to a common boiler.

This form of boiler, by its extended length and diminished diameter, allows of greater strength, with equal capacity, when required, than those generally in use,—it is enclosed in brick-work when intended for a fixed engine, and surrounded from end to end by a flue, which passes into the chimney at E; 3, is the water line in the boiler,—the fire never reaching above this water line; 4, is the fire-door; 5, the fire-bars; 6, the ash-hole; and 7, the fire, which is very long and narrow, so that the fresh coals are always fed at the mouth of the furnace, and the fire occasionally pushed back upon the grates to receive them;—the smoke from the fresh coals passing over those already in ignition, is better consumed.

The boiler is suspended in the middle of the flue, by bands of iron between the ends of the boiler-plates, as shewn in the drawing; and these are secured by plates and fastenings upon the stone-work. Above the fire-door 4, is another door, to prevent the cold or external air from acting upon the end of the boiler or man-hole 1; when this is opened, the man-hole is easily reached, and is conveniently situated for cleaning the boiler; 8, is the waste steam-pipe, as it enters the chimney; *f*, the pinion for conveying the power to the large bevilled wheel *g*. In fig. 4, *n*, is a cock and waste-pipe, for letting off the steam from the boiler into the chimney, or in any direction, when the engine is not required to work.

The patentee claims, in the first place, the making use of, and obtaining, power from the currents of steam, or other elastic vapours, in their passage from the boilers or vessels in which they are generated or produced, to the cylinders of steam-engines.

Secondly,—the several arrangements or combinations of machinery, hereinbefore described, for effecting that purpose.

And lastly,—the severally described arrangements or combinations, as separate and distinct means or engines, for producing or obtaining power when applied to boilers or generators, as well as when in connection with the hereinbefore described boiler or generator; or when used in the process of distillation, for warming buildings, or other purposes, and therewith producing power.—[*Inrolled at the Rolls Chapel Office, October*, 1840.]

To George Henry Fourdrinier *and* Edward Newman Fourdrinier, *both of Hanley, in the county of Stafford, paper-makers, for an invention of certain improvements in steam-engines for actuating machinery, and in apparatus for propelling ships and other vessels on water.*—[Sealed 17th September, 1840.]

This invention may be divided into two parts, consisting, firstly, of improvements in steam-engines for actuating machinery; and secondly, for an improved apparatus for propelling ships and other vessels on water.

The improvements in steam-engines consist in applying and working two pistons in one cylinder; which pistons are simultaneously actuated by the expansive force of the same volume of steam.

The manner of effecting this, will be readily understood by referring to the drawings, Plate VIII., in which fig. 1, represents a longitudinal section of the engine, taken through the middle of the cylinder, which is made to vibrate on pivots; and fig. 2, is a sectional plan view of the same, shewing the slide-valves, pistons, &c. The cylin-

der is shewn at *a, a,* and the pistons at *b, b.* Steam is admitted into the steam-box *c,* and from thence passes into the middle of the cylinder by the aperture *d,* where, by its expansive force, it drives the pistons to the ends of the cylinder, as shewn in the figures. The pistons being thus driven to their greatest distance from each other, on shifting the valves into the position shewn in fig. 2, steam will pass from the steam-box *c,* through the passages *e, e,* to the sides of the cylinder, and thereby cause the pistons to approach each other towards the middle of the cylinder. The partially condensed steam or vapour, contained in the central part of the cylinder, marked *a, a,* will be thereby forced out through the aperture *d,* in the direction of the arrows, and proceeding through the valves *f, f,* will escape by the exit passages *g, g.* When the pistons have arrived at the middle part of the cylinder, the valves *f, f,* are again shifted, and steam is admitted between the pistons, which are again impelled towards the ends of the cylinders, as before described.

The rod of the lower piston is connected to the crank-shaft *h,* and the rod of the upper piston to the cross-head, bolted to the lateral rods *i, i,* which are also connected to the crank-shaft.

Fig. 3, represents a longitudinal section of a modification of the above-described engine. In this construction, the cylinder is divided into two parts, by a partition *j*; and the pistons do not expand simultaneously, as in the former construction, but one piston begins to move when the other is at the quarter stroke.

This arrangement is made for the purpose of overcoming the dead points. When one piston is at the dead point, the other is exerting its full force. This is easily effected by an arrangement of valves, as will be readily understood by any competent mechanic.

The passage communicating with the part a^1, of the cylinder, is represented as open, and the steam exerting its elastic force against the under part of the piston b^*; while the communication between the steam-box *c*, and the part a^2, of the cylinder is cut off, and steam is passing into the cylinder at a^4, by the passage *k*, and pressing against the upper side of the piston *b*. Steam is now escaping from the part a^2, and a^3, of the cylinder, in the direction of the arrows, and will pass through the exit passages *g*, *g*. The motion of both pistons is communicated to the crank-shaft by means of the connecting rods *i*, *i*, in the same manner as in figs. 1 and 2.

The apparatus for propelling ships and other vessels on water, consists of certain arrangements of mechanism, whereby a volume of air may be forced against the water, under the bottom of the vessel, in the direction of its stern, for the purpose of impelling the vessel in an opposite direction. The arrangement of parts for effecting this object is shewn in the drawings, at figs. 4 and 5. Fig. 4, represents a cross section of a vessel, with the improved apparatus applied thereto; and fig. 5, is a longitudinal section of the same.

The air is to be compressed by an air-pump, to the same density as the water under the ship's bottom, and is made to pass from the cylinder of the air-pump through a pipe or tube *a*, into the air-chamber *b*; see fig. 5. In this air-chamber a hollow plug *c*, is adapted to a valve *d*, *d*, in which the said plug may be moved up or down, for the purpose of closing the valve when required.

The compressed air, occupying the chamber *b*, passes through the hollow plug *c*, and down the tube *e*, in the direction of the arrow, and enters the water by the valve *f*. The bottom of the vessel has two guards *g*, *g*, made of wood or other suitable material adapted to it, and running parallél to the keel. The air, when it passes through the

valve *f*, is guided under the bottom of the vessel by the guards *g*, *g*, which prevent it from escaping up the sides, and by its pressure against the water, in the direction of the stern, impels the head of the vessel forward. When the vessel is required to be backed, the tumbling valve *f*, is brought into the position shewn by dots in fig. 5. This is effected by turning the spindle *h*, on which there is mounted an endless screw *i*, taking into a sector-rack *j*. The sector-rack is affixed to the valve *f*, and by its movement causes the valve to tumble over, and one of its vanes to be brought to abut against the projecting pieces *k*, thereby causing the air to escape in the opposite direction. When the vessel rolls about in a heavy sea, it may be found desirable to force the air from the air-pump under the most depressed side of the vessel; and in order to effect this, a pendulum regulator *l*, is connected to the hollow plugs *c*, which, as it vibrates, raises or depresses the plug *c*, and thereby opens or closes the air passage from the box or chamber *b*, to the tube *e*.

Fig. 6, represents another method of applying the condensed air. The principal difference between this construction and the last described, being the manner of effecting the backing astern. The compressed air is supplied in a similar manner, and passes down a pipe or tube *e*, eventually escaping by the sliding hollow valve *f*, into the water. When required to back the vessel, it will only be necessary to raise the valve *f*, and lower the other valve *p*, which act simultaneously by turning the pinion *m*, gearing into two racks, formed on the rods *n*, and *o*, to which the valves are connected.

If it is considered desirable, the compressed air may be supplied to the air-chamber in separate volumes, by placing a valve in the supply pipe, and causing this valve to open and shut by any convenient means. The effect of this

method of supplying the compressed air will be, that between every volume of air beneath the bottom of the vessel, there will be a body of water, against which the air will be forced, and thereby cause the vessel to be impelled in an opposite direction.

The patentees do not confine themselves to the precise arrangement of parts herein shewn, as they may be varied to suit circumstances; but claim, firstly, the application of two pistons working in one cylinder, in the manner shewn in figs. 1, 2, and 3; and secondly, propelling vessels by forcing a volume of air against the water beneath the bottom of the vessel, in the manner shewn and described.—[*Inrolled at the Rolls Chapel Office, March,* 1841.]

Specfication drawn by Messrs. Newton and Berry.

To George Alexander Gilbert, *late of Southampton Buildings, in the county of Middlesex, but now of Norfolk House, Battersea, in the county of Surrey, Gent., for his invention of certain improvements in machinery or apparatus for obtaining and applying motive power.*—[Sealed 10th September, 1840.]

This invention of improvements in machinery or apparatus for obtaining motive power, consists in certain novel features in the construction of engines, to be actuated by steam, air, gas, or other elastic fluid, whereby the patentee proposes to dispense with the ponderous cylinder heretofore employed, and substitute, in its place, certain tubes, which slide one within another, in the same manner as the tubes of a telescope.

Fig. 1, Plate VIII., is a side elevation of the engine, complete in all its parts; fig. 2, is a plan or bird's-eye view of the same; and fig. 3, is a vertical section of the working

parts, taken longitudinally, the fly-wheel and cranks being removed.

That part of the engine which is intended as a substitute for the ordinary cylinder, consists of two tubes *a*, and *b*, fig. 3. One end of each tube is bolted to a steam-box or chamber, which is divided in the middle into two compartments *c*, and *d*. The tubes *a*, and *b*, slide on stationary tubes *e*, *f*, affixed to the frame-work; and there are stuffing-boxes *g*, *g*, formed on or attached to the ends of the tubes *a*, and *b*, to keep the joints steam-tight. There are two cocks *v*, *v*, at the under parts of the steam-box, which are for the purpose of allowing any steam, air, or vapour, contained therein, to escape previous to setting the engine to work.

Valves *h*, and *i*, of the ordinary construction, are to be actuated in such manner that they will alternately admit the steam into the tubes *e*, or *f*, and afterwards allow it to escape therefrom. The valve *h*, is in the position it would occupy when steam is passing into the tubes *a*, and *e*; and the valve *i*, has its exit passage open, in order to allow the steam in the tubes *b*, and *f*, to escape.

Steam is conveyed from the boiler by the pipe *j*, into the end steam-box *k*, from whence it passes through the valve *h*, into the stationary tube *e*, and from thence through the sliding tube *a*, into the steam-chamber or box *c*, in the middle of the machine. The steam exerting its elastic force against the partition or end of the chamber *c*, propels or forces the box and sliding tubes *a*, *b*, *c*, and *d*, toward the right-hand; and the steam or other vapour previously occupying the chamber and tube *d*, *b*, and *f*, will be thereby expelled and escape through the (then) open valve *i*, and pipe *l*, either to the atmosphere or into a condenser.

When the sliding tube *b*, has arrived at the end of its course, the valves *h*, and *i*, are shifted by means of an ex-

centric, not shewn in the drawing, which, acting upon the rod and levers *m*, *n*, changes the positions. Steam is then admitted by the pipe *o*, and passing through the valve *i*, the fixed tube *f*, and sliding tube *b*, enters the steam-box or chamber *d*, where exerting its elastic force, as before, it propels the sliding tubes and box in the opposite direction, that is, as the dotted arrow; and the steam which had previously exerted its elastic force in the chamber and tubes *a*, *c*, and *e*, being by these means expelled therefrom, passes off through the exit pipe *p*. The box *c*, *d*, and tubes *a*, *b*, are mounted on pulleys or anti-friction rollers *q*, *q*, *q*, *q*, (see figs. 1 and 2,) which run in grooves, formed in the frame-work.

The reciprocating movement of the box and tubes produces or is converted into a rotary movement in the following manner:—Connecting rods *r*, *r*, are attached to the exterior of the steam-box, by means of pivots, represented in the plan view, fig. 2. The reverse ends of these rods are connected to the crank *s*, *s*, of the main shaft *t*, which is mounted in plummer-boxes *u*, *u*, *u*. From this shaft the moving power is communicated by a pulley and band, governed by a fly-wheel, for the purpose of driving other machinery.

The patentee concludes in the following words:—"I would wish it to be understood, that although I have generally mentioned steam, as the vapour employed for actuating the engine, yet sometimes I employ air or gas, under certain circumstances, and find them more economical than steam; I therefore do not intend to confine myself to any particular fluid or fluids for actuating my improved engine, nor do I confine myself to the precise arrangement of parts shewn in the drawing, as I sometimes construct the engine in such a manner that the sliding

tubes shall move up and down perpendicularly, instead of sliding in the horizontal manner herein shewn and described.

"Lastly,—I desire it to be understood, that I claim, as my invention, the mode or method of producing motive power by the use of steam, gas, or any other fluid, conjointly or separately, as above described."—[*Inrolled in the Rolls Chapel Office, March,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS RICHARDSON, *of Newcastle-upon-Tyne, chemist, for a preparation of sulphate of lead, applicable to some of the purposes for which carbonate of lead is now applied.*—[Sealed 9th December, 1839.]

THE patentee commences his specification by saying, that he uses the term sulphate of lead in the common and popular sense; and means thereby a combination of sulphuric acid and protoxide of lead; and he does not use it purely in any scientific sense, to denote the particular combination of the two; that is, one atom of sulphuric to one atom of protoxide of lead.

The invention consists in using acetic acid and protoxide of lead with sulphuric acid, so as to effect a combination of sulphuric acid with protoxide of lead, and produce a body which is applicable to some of the purposes to which carbonate of lead is applied. This object is effected in the following manner:—Take a quantity of the protoxide of lead of commerce, (that which is known as flake litharge in preference,) put it into a tub, and mix with it a quantity of acetic acid and water, in the proportions hereafter mentioned. The whole is well agitated in a tub, by a suitable apparatus, and continued sufficiently long to enable the

acetic acid to act upon the protoxide of lead, and convert it into acetate of lead. The acetic acid should be of the specific gravity of 1.046, and used in the proportion of one part to fifty-six parts of protoxide of lead. A larger quantity of acetic acid may be used, but the above proportion is most economical. The agitation is continued, and when a portion of the protoxide of lead is converted into acetate of lead, sulphuric acid, of the specific gravity of 1.5975, or thereabouts, is poured into the tub, through a leaden or other convenient pipe, at the rate of about one pound per minute, until a sufficient quantity of sulphuric acid has been added to convert all the protoxide of lead into sulphate of lead. The quantity of sulphuric acid to be added, should be in the proportion of twenty parts thereof to 112 parts of protoxide of lead; but the proportion of sulphuric acid may be increased to forty parts. The agitation is continued until all the protoxide of lead has combined with the sulphuric acid, and the sulphate of lead thus produced is removed to convenient vessels, where it is washed free from extraneous matter. When washed, the sulphate is ground in water and dried in stoves, similar to those employed in white lead manufactories. The sulphate of lead thus prepared, will have a body and consistence, and may be applied to some of the purposes to which carbonate of lead is now applied, such as painting, glazing pottery ware, and other uses.

A drawing and description of the apparatus employed for agitating the protoxide in the tub, is given in the specification; but as it does not possess any novelty, and in fact constitutes no part of the invention, (being distinctly disclaimed in the specification,) we have not thought it necessary to present it to our readers.

The patentee says, in conclusion, "I do not claim any particular form of vessels or apparatus, in which or with

which my operation may be carried on; and I consider the proportions above mentioned, to be the best for conducting my invention, although a larger proportion of acetic acid would facilitate the process, and might occasionally be usefully adopted to save time; but for purposes of commerce, where economy is an object, the above proportions are best; but any proportions will do, so long as the quantity of acetic acid employed is not sufficient to convert all the protoxide of lead into acetate of lead of any kind. As respects the use of acetic acid, in the aforesaid process, I have also to notice some other substances which may be employed instead of free acetic acid; for example:—acetate of lead may be used in such a proportion as to afford the same relative quantity of acetic acid; and in such case, the agitation is required merely to mix the ingredients intimately. Acetate of soda may also be employed for the same purpose, by introducing so much of it as contains the requisite quantity of the acid. Other acetates may also be used, but the above are the only ones which I have tried."—[*Inrolled in the Inrolment Office, June,* 1840.]

To Samuel Hill, *of Sloane-street, Chelsea, in the county of Middlesex, Gent., for improvements in the making of bread and biscuits.*—[Sealed 25th March, 1840.]

This invention relates to a method of making bread and biscuits, by combining with the materials heretofore used for these purposes, certain ingredients that have not been hitherto so employed. In carrying out his invention, the patentee uses the flour of wheat, rye, barley, Indian corn, or rice, and such other matters as have been generally used for making bread, &c.; and combines, with one or

more of them, one or more of the following ingredients, viz.; —arrow-root, tapioca, cassava, sago, millet, flour made from the kittul tree, or corokan seed, or the fruit of the palmyra tree.

In making bread, the inventor takes four parts of one or more of the first-mentioned ingredients, and mixes therewith one part of one or more of the second; and when rice is used, it should be in the proportion of from one-sixth to one-eighth of the first-mentioned ingredients; and, before using it, the rice is to be steamed or simmered in hot water, or only ground into flour; steaming, however, is preferred, as it makes lighter bread. The materials are then kneaded, made into dough, and fermented with yeast, a sufficient time being allowed for the dough to rise; it is then made into loaves and baked in the ordinary manner. When brown bread is required, a small portion of cocoa is mixed with the water employed for making the dough; and as there is more saccharine in some of the ingredients than in wheaten flour, a good bread is produced.

Those ingredients, above alluded to, which have not hitherto been employed in making bread, contain starch, gluten, gum, and saccharine; and although, when employed alone, they would not make good bread, yet, when combined with the other materials, the quality of the bread is very much improved, and rendered more wholesome and digestible; and as some of the materials mentioned, are cheaper than wheat flour, the price of bread would be reduced.

The patentee does not claim, as novel, the use of any of the ingredients above named, when employed separately, for making bread, but only combining them, or some one or more of each of the classes, for this purpose; and he also remarks, that bread made in this manner keeps much longer than when made in the ordinary manner.

In making biscuits, dough is prepared from the two classes of ingredients; and then the biscuits are made in the usual manner, and baked in a hot oven. The combination of steamed rice, with other ingredients containing more saccharine than wheaten flour, corrects its harsh and adhesive qualities, and is an improvement in making biscuits, which will produce them at a less cost, and highly nutricious.

In making bread for horses, cattle, sheep, pigs, calves, dogs, and other animals,—a coarse bread, without yeast, may be made from maize or Indian corn, oat-meal, rye-meal, malt dust, grain, sago, paddy rice, cassana, potatoes, flour, bean meal, pea meal, brewers' grains, poomak, corokan, and prinatto. Two or more of the above may be made into bread, with water and beer, liquid from the distillers; jelly made from Jaffra moss, oil and fat, or graves, may be added, according to the quantity of bread that is required. The proportions may be varied, but a very nutritious bread is produced by making a dough of four of the above-named ingredients, in nearly equal proportions.—[*Inrolled in the Inrolment Office, September,* 1840.]

To James Hadden Young, *of Lille, in the Kingdom of France, now residing at No.* 106, *Regent-street, in the county of Middlesex, merchant, and* Adrien Delcambre, *of Lille, aforesaid, manufacturer, for an improved mode of setting-up printing types.*—[Sealed 13th March, 1840.]

This invention consists in a set of elevated receptacles or chambers, containing types, which are pushed out of the said chambers, in the order required, by levers, and what

we call pushers, acted upon by keys, somewhat similar to piano-forte keys, touched for that purpose by the fingers and thumbs; and when pushed out of their respective chambers, the types fall upon an inclined plane, grooved and set at so steep an inclination, that the type, on being pushed out of its chamber, instantly slides down the groove adapted to receive it; this groove, leading to one point at the lower end of the inclined plane, where all the grooves on the inclined plane meet immediately over a small box, and drops into the said box. This box answers the purpose of of the ordinary composing stick, wherefore we call it the composing box; and the type is deposited therein by the mere force of its own weight, in a proper position to receive the printer's ink, and is afterwards removed to the ordinary chases for that purpose.

The machine, as represented in Plates IX. and X., is arranged for "setting-up" 76 different letters or spaces, merely for the purpose of explaining the movements of the various parts; but in a machine suitable for composing type in the ordinary way, the same number of receptacles or chambers for the types would be required as is provided in the "case" now ordinarily used in printing offices.

Fig. 1, is a front elevation of the machine, with some of the casing, which covers it from dirt, removed to shew the mechanism more distinctly; fig. 2, is a vertical side section of the same; and similar letters are used to denote similar parts in all the figures. A, A, is the casing and frame-work of the machine; in the middle of which is a horizontal bed-plate B, to which is attached bearings *m*, which carry the pins C, forming axes for keys, like piano keys D, D, D, to vibrate upon; three rows of which are shewn in the drawing. The ends of the keys are connected by joints 8, to the inclined levers E, E, E; on the upper part of each of which levers are fixed inclined planes or wedge-shaped

pieces, acting as cams F, F, (shewn on a larger scale hereafter); which wedge-shaped pieces act against the lever-frames G, G, called by us pushing-frames, as by them the types are forced out of the receptacles or chambers H, H, H. These chambers consist of brass bars, placed parallel to each other, and raised one above the other, as in fig. 1, to correspond with the inclination of the back of the inclined plane J, and forming open channels a hair's breadth wider than the types, so that they may slide down freely; for this purpose, they are mounted in an inclined position, upon a frame-work I, as in fig. 2, which is at right angles to the inclined plane J. This frame-work (it will be seen in fig. 1,) is in the form of a pointed roof, and is strengthened on the under side by cross ribs *x*, *x*, cast upon it for the purpose of supporting the whole weight of the collected types; it is also firmly attached to the frame-work A, by screws at y, y^1. The levers E, pass through slots *t*, cut in the lower arms of the supports *u*, (see fig. 5); these supports are screwed to the under side of the inclined plane J, and *v*, *v*, are centre screws, upon the points of which the pushing-frames vibrate. To the supports *u*, are fixed, by screws, the springs *w*; the points of which act against the pushing-frame G, in an opposite direction to the inclined planes or wedges F, and force back the frames to their former position, as the wedges recede from the faces of the frames, (which is caused by the gravity of the levers E,) and consequently bringing back the keys D, to their former position.

J, J, is a grooved plate, also placed in an inclined position, and forms the inclined plane hereinbefore alluded to, as one of the principal features of our said invention, see fig. 2. It is provided with strengthening ribs 5, see figs. 2 and 5. This grooved inclined plane receives the types immediately on their being pushed out of their chambers, (there being

a groove to each type); and as soon as each type is pushed out of its particular chamber, it slides down the inclined plane, and is conveyed by the cross channels *n*, *n*, (see fig. 1,) to the box, which we call the setting-up or composing box K, at the point J^1; this box serves the purpose of the ordinary "composing stick," and receives the whole of the type while it is being formed into pages or sentences.

L, is a small lever or arm, which is fixed to a vibrating spindle L^1, extending across the machine, and mounted upon pivots at each end, connected by a joint to the lever S, of the parallel motion *r*, which is fixed by a bracket *b*, to the framing A, and at every depression of a key, the lever L, vibrates, and the end L^2, of the parallel bar *s*, passes through an opening in the side of the box K, and comes in contact with the column of type which is being formed, and pushes it away from the point J^1, of the inclined plane, as shewn by dotted lines in the detached figure 3, so that another type may fall into the space caused by this movement; and the opposite end of the column is supported upon a brass slide M, which also recedes with the type, at every stroke of the lever, through a notch in the opposite side of the box, and is prevented from slipping too far by the pressure of a spring N, against it, which causes the slide to move only so far as it is pushed by the lever.

The lever L, receives its motion from vertical arms O, O, O, one of which is fixed to each key, and which arms are shewn, with the keys detached, in figs. 12, 13, and 14; and as soon as the depression of the key takes place, its arm O, presses upon the edge of the bar P, which is also fixed to the spindle L^1, and forces the lever L, through the notch in the side of the box K, and its end L^2, against the type which has just dropped from the inclined plane J. Z, is a spring attached at one end to the framing A, by a bracket 7, and its opposite end presses against one side of the bar P, in an

opposite direction to the arms O, to bring the lever and its end L^2, into its former position, after it has forced the type away from the point J^1, of the inclined plane, and thus to leave a space for the next type to fall iuto the box ; but in order to guard against the breaking of a type, should it stick in the channel J^1, that part of the channel is made to move on a hinge, and is supported on a spring Q, and thus allows the type, when pressed upon by the shoulder L^2, fig. 3, of the parallel lever S, to yield or recede, till the pressure is removed, when it drops into the box K. R, is a covering plate, which we call a shield, shewn in figs. 2 and 8, but partially removed in fig. 1, the better to see what it covers. This shield is to prevent the types from jumping out of the cross grooves *n*, should they fall too rapidly.

In fig. 2, a line of type is shewn as having been just completed, in the box K, and the slide M, as projected to its full extent of the box; this will also be clearly seen by reference to fig. 4, which is a plan of the box detached from the machine. As soon as the line of type is filled, it is necessary to move it sideways, to make room for the next line to be placed in the box K;—this is effected in the following manner:—

At one end of the machine is a handle and wheel S, (shewn in fig. 1,) one revolution of which will move the type sufficiently for the next line. This wheel is fixed to a shaft T, which, at its opposite end, carries a toothed wheel U, and is mounted on a bearing V, in the bottom of the box K. On the face of the toothed wheel is a cam W, projecting from it as much as the width of the type, which acts upon a stud X, fixed to the brass slide Y, which moves in dove-tailed grooves in the box K, and has a spring Z, on its under side, (shewn by dots,) for the purpose of making it move stiffly. This slide Y, as will be seen in fig. 4, supports the type on one side, and on the other is a similar

acting slide *a*, which also supports the type; this is also provided with a spring Z, underneath, to prevent it giving way to the motion of the cam too readily.

The brass slide M, which moves through a notch in the side of the box, has a guide pin *b*, at one end, passing through a bearing *c*, (see fig. 2,) fixed to the bed-plate B, of the machine, for the purpose of keeping its motion steady; at this end also is an arm *d*, connecting it with a toothed rack *e*, which gears with the wheel U, and passes through a bearing *f*, on the under side of the box, and also through a bearing 1, fixed to the upper side of the bed-plate B.

It will now be evident, that when the workman turns the handle S, the cam W, will act upon the stud X, of the slide Y, and force it back in the direction of the arrow, as well as the several lines of type in the box, and the slide *a*, on the other side of the type also; when, as soon as the cam has left the stud X, a spring *g*, fixed to the bearing V, will force back the slide to its former position. The teeth of the wheel U, will now move the rack *e*, and bring into the box the slide M, (for the wheel U, it will be seen, on referring to figs. 2 and 16, has a portion of its surface without teeth,) so that whilst the cam is moving the slides Y, *a*, and the lines of type between them, it shall not move the rack and slide M, in order that the workman may know when a line of type is filled.

There is a rod *h*, seen in figs. 1, 2, and 4, which passes through a loop *i*, and bearing 1; and 2, is an arm, with an arm extending from one side of the slide M; and as the slide recedes from the box, the eye of the arm comes in contact with the stud 3, and brings the point of the rod *h*, within the loop *i*, which will indicate that the line is complete; and as the slide M, is brought again into the box, by the rack and pinion, the eye of the arm will come in

contact with the stud 4, and thus bring the point of the rod out of the loop to its former position.

That part of the box K, where the page of type is composed or set up, is made to slide in dove-tailed grooves, (see figs. 1, 11, and 16); and as soon as a page is complete, the workman withdraws that part of the box by means of a handle *k*, and along with it the whole of the type, so that it may be placed in the ordinary chase for printing.

Figs. 5, 6, 7, 10, are detached portions of the machine, on a larger scale, shewing the movement of the lever E, and the wedge-piece F; which, as soon as a key is depressed, pushes the type from its chamber H; the action in fig. 6, being shewn by dotted lines.

Fig. 8, is a plan of the inclined plane J, with the shield R, fixed upon it; and at one side is a section of some of the elevated receptacles or chambers H, with the types therein; a longitudinal section of the composing box K, is also shewn in this figure.

Fig. 9, is a transverse section, shewing the form of the arm *d*, slide M, rack *e*, and arm and eye 2; and fig. 11, is a transverse section of the box K, shewing the side elevation of the slide M, and rod *h*, projected from the box to their full extent.

In order that the workman may be guided in his operations with the machine, and that wrong letters may not be brought into the composing box, we have marked upon each key the letter contained in the chamber H, with which its action is connected; and the chambers should also be marked with similar letters, that the persons employed to fill or charge them, may not insert the wrong letters therein.

Figs. 12, 13, and 14, are side elevations of the keys D, detached from the machine, shewing the form of the vertical arms O; fig. 15, is a plan of the keys D, shewing the joints

8, to which the levers E, are connected; fig. 16, is a transverse section through the box K, on a larger scale, with the slide M, projected out of the box, the arrow indicating the direction in which the cog-wheel U, is moving, so as to bring the slide M, into the box, by means of the rack *e*; and fig. 17, is a plan of the same.

Should the machine be extended in the number of its keys and chambers of type, it will of course be necessary to increase, in a similar proportion, the number of grooves in the inclined planes J; but these grooves should be so arranged, that the length of the parallel grooves, combined with the cross channels, should be so much shorter as to compensate for the differences in the time the types should be sliding down into the box, so that the letters should fall in the same order of time in which the keys are struck.

In conclusion, the patentees say,—"Having thus described the various parts of the apparatus, and the mode of operating with the same, we hereby disclaim all exclusive right to the principle of using keys, similar to piano-forte keys, as the medium of communicating the necessary movements to the various parts of our apparatus, such keys having been often used before, in the various unsuccessful attempts hitherto made to compose types by machinery; but we claim, as our invention, first, the use of an inclined plane for setting up printing types; by the inclination of which plane, the types placed thereon, in whatever manner, are caused to slide by their own gravity to a given point, whether such point be the required position in the composing box or receptacle, answering the purpose of the composing stick, as shewn in the drawing, or any other required point; secondly, the particular form and arrangement of the elevated receptacles or chambers H; thirdly, the pushing frame G, and wedge-shaped pieces F, by which the types are pushed on to the inclined plane; fourthly, the hinged

piece J^1, and its spring; fifthly, the composing box, and the various mechanical movements connected therewith; and sixthly, the shield which prevents the escape of the types out of the grooves, or from off the inclined plane."—[*Inrolled in the Inrolment Office, September*, 1840.]

To HAROLD POTTER, *of Manchester, in the county of of Lancaster, Esq., for certain improvements in printing calicos, muslins, and other fabrics.*—[Sealed 9th December, 1839.]

THIS invention is described as consisting, firstly, in a method of printing calicos, muslins, or paper for paper-hangings, by means of an apparatus commonly known among calico printers as a surface machine. This machine, according to the invention, has a colour-box or colour-boxes, with two or more distinct colours in the same box, but arranged in such a manner, that the colours are kept separate from one another, and are supplied separately, but simultaneously to the same endless sieve, and from the sieve to the cut roller.

The second part of the invention, is for the use and application of engraved, cut, or figured copper or other metal rollers, for printing paper-hangings. The patentee says, "by means of these metal rollers, he is enabled to produce a delicacy of light and shade, which cannot be done by block printing."

Fig. 1, Plate VIII., represents a section of a colour-box, with colour roller, sieve, and cut roller, constructed according to the present invention; and fig. 2, is a plan view of the colour box and roller alone.

The colour box is seen at *a*, and the roller at *b*; the endless sieve is represented at *c*; and *d*, is the cut roller,

which gives the pattern to the calico, muslin, or paper. Grooves *e*, *e*, are formed in the roller, and corresponding partitions *f*, *f*, are fitted into the trough or box. These partitions are fitted so accurately in the grooves of the roller, that no colour can escape over them; and, by this arrangement, the colour-box is divided into three separate and distinct compartments, each of which may be furnished with a different colour; and all are supplied simultaneously to the sieve.

The doctor *g*, scrapes the superfluous colour from the sieve, and it is conducted down again into the trough by guides *h*, which are in fact continuations of the partitions *f*, *f*, and are attached to the top of the partitions, for the purpose of preventing the surplus colour, which is scraped off by the doctor, from falling into the wrong compartment.

The patentee claims, "taking two or more colours from the same surface sieve, in the process of surface printing upon calico, muslin, or paper; and also printing patterns upon paper for paper-hangings, by means of engraved figured or cut metallic rollers." And he further claims, "any combination of the above two improvements, namely, printing from metallic rollers and surface printing, as above described, when the fabric printed upon is paper for paper-hangings."—[*Inrolled in the Inrolment Office, June*, 1840.]

To THOMAS LAWES, *of Canal Bridge, Old Kent-road, in the county of Surrey, feather factor, for his invention of certain improvements in the method or process and apparatus for cleansing and dressing feathers.* —[Sealed 10th November, 1840.]

MY invention of improvements in cleansing and dressing feathers, consists, firstly, in the application or use of ma-

chinery for washing and cleansing feathers, instead of the methods hitherto usually adopted; and secondly, in an improved arrangement of apparatus for drying and dressing the feathers after they have been operated upon by washing.

The operation of washing or cleansing the feathers may be effected by any convenient mechanism; but, in order that my invention may be perfectly understood, I have shewn in the accompanying drawing, an arrangement of apparatus that has been found to answer the purpose exceedingly well. It consists of a long cylindrically-formed stationary vessel, having a horizontal shaft, furnished with radial spokes or beaters, mounted in bearings inside of it; such shaft being caused to revolve by any suitable mechanism. A longitudinal trough is formed along the bottom of this vessel, and is covered or furnished throughout its entire length with a sieve or strainer, made of strong wire or metal bars; and the curved sides and ends of the cylindrically-formed vessel are also furnished with strainers, made of strong wire gauze; which, by being placed about three-eighths of an inch from the sides and ends of the vessel, forms a clear passage, communicating with the trough below.

Plate VIII., fig. 1, represents a longitudinal section, taken through the middle of the whole apparatus; and fig. 2, is a cross or transverse section of the same, shewing the working parts.

The cylindrically-formed vessel is shewn at *a*, *a*; and the longitudinal shaft at *b*, *b*. This shaft is furnished with radial arms or beaters *c*, *c*, *c*, *c*, and is mounted in bearings *d*, *d*, fixed in the vessel *a*, *a*.

The longitudinal trough *e*, *e*, *e*, *e*, below, is furnished with the coarse sieve or strainer *f*, *f*, *f*, *f*.—On one end of the shaft *b*, *b*, a cog wheel *g*, *g*, is mounted, and is driven by a pinion *h*, mounted on a shaft *i*, *i*; this shaft revolves in

bearings *j, j,* and the moving parts of the apparatus are caused to rotate, by communicating motion to the pulley *k,* on the shaft *i.* The sides and ends of the vessel *a, a,* are lined with a wire gauze sieve or strainer *l, l,* the lower end of which descends into the trough *e, e,* below the coarse strainer *f, f,* as before mentioned.

When it is required to use the apparatus, a sufficient quantity of feathers is placed in the vessel *a, a,* which is then filled with water by the pipe *m*; and upon causing the longitudinal shaft *b,* to revolve, the beaters *c, c,* will agitate the feathers, and separate the dirt and other extraneous matters therefrom, which will descend either through the sieve *f,* or through the wire gauze *l,* into the trough *e, e,* from whence it will pass off through the apertures *n, n.*

When the feathers have been sufficiently washed, the water is drawn off by the apertures *n, n,* in the trough *e, e,* and the feathers taken out either from the open top of the vessel *a, a,* or through the door *o,* at one end thereof; they are then well heated, by pouring boiling water on them; and after being pressed, to express the superabundant moisture from them, they are submitted to the drying process, in any convenient manner.

The apparatus I employ for drying and dressing the feathers, is shewn at figs. 3 and 4, in the accompanying drawing; fig. 3, being a transverse section, and fig. 4, a longitudinal section of the apparatus, which consists of a large metal cylinder *p, p, p, p,* mounted loosely in bearings *q, q,* and enclosed within a circular space, (see fig. 3,) formed partly by an arch *r, r,* constructed of brick-work, for the purpose of retaining the heat, and partly by a semicircular iron or other metal guard *s, s,* which envelopes the lower part of the cylinder, and protects it from a too sudden action of the heat given out from the furnace below.

The revolving cylinder *p, p,* is furnished with arms *t, t, t, t,* which are attached to the inner side thereof, and project towards the centre; and as the cylinder revolves, the lumps or bundles of feathers which would be apt to adhere or mat together when damp, are broken up so as to be more regularly acted upon by the heat. This object is also assisted by the radial arms *x, x,* which support the cylinder. Certain parts of the ends and sides of the cylinder are reticulated, or formed of wire gauze, (as seen at *u, u,*) for the purpose of allowing the steam, arising from the damp feathers, to escape into the annular space around the cylinder; from whence it ultimately escapes into the atmosphere, through the bearings *q, q,* in which the axle of the revolving cylinder is mounted, and which are made large and loose for this purpose, as seen in the drawing fig. 4.

The cylinder *p, p,* is made to revolve, by applying power to the band-weel *v, v,* mounted on the same shaft, and is heated by the fire from the furnace, which acts upon the under part of the metal guard *s, s*; and by this means, the heat is regularly diffused over the surface of the cylinder as it revolves, and thereby prevents the feathers from becoming singed or spoiled by the too sudden application of heat.

When the feathers have been sufficiently dried and dressed, they are removed from the cylinder through a door *w,* at one end thereof; a corresponding door *x,* being also made in the end of the semi-circular iron guard *s, s,* for the purpose of getting at the door *w,* of the cylinder.

Instead of enclosing the revolving cylinder within a casing of brick-work, as shewn in the drawing, I sometimes place it within one or more cylinders, having only small openings made in the outer ones, to allow the steam, arising from the damp feathers in the inner cylinder, to escape into the atmosphere; and, upon applying heat to the outer

cylinder, either by placing it in an oven, or making a fire beneath it, and causing the inner one to revolve, the heat is regularly and uniformly distributed throughout the said inner cylinder, and the feathers contained therein become dried and dressed in a proper manner.

Having now described my invention, and the manner of carrying the same into effect, I wish it to be understood, that I do not confine myself to the arrangement of apparatus herein shewn, as the same may be varied; or other different apparatus may be employed to suit circumstances, without departing from the nature of my invention; but I claim, firstly, the *application of machinery* to washing and cleansing feathers, by whatever mechanical arrangements the operation may be performed; and secondly, the arrangement of apparatus herein shewn and described, for the purpose of drying and dressing feathers; and also the employment of two or more cylinders, placed one within another, for the purpose above mentioned, whether the said apparatus be employed in conjunction with the washing apparatus or without it.—[*Inrolled in the Petty Bag Office, May,* 1841.]

To SAMUEL HALL, *of Basford, in the county of Nottingham, civil engineer, for his invention of improvements in the combustion of fuel and smoke.*—[Sealed 14th January, 1841.]

THE claims set forth by the patentee, in his specification, are the following:—First, "I claim conveying the fuel from the front to the back of the furnace, and for raking and clearing the fire-bars and levelling the fire, whether the apparatus for effecting such operation is actuated by ma-

nual labour or mechanical means; secondly, I claim retarding or regulating the combustion of the fuel, during the process of carbonization, by means of bars having slits or projections formed in or on them; which slits or projections extend only part of the length of such bars, and may be wholly or partially closed by slides, so as to regulate the supply of atmospheric air, and consequently the consumption of the fuel; thirdly, I claim the application to the feeding hopper of a plate, which may be lowered so as to allow the scoria or slag to be cleared out of the fire-place, or for supplying fuel through the doors on to the fire; fourthly, I claim sprinkling the fire in the fire-places with water, by the apparatus hereinbefore described; fifthly, I claim placing the pipes to heat the atmospheric air or gases in any part of the flues between the furnace and the chimney, for the purpose of increasing the combustion of the fuel.—I make this claim as an addition to a claim set forth in a former patent; and I further extend this claim to any other means whatever of heating air, to effect the combustion of smoke or gases, by being sent into the entrance of the fire-place, to pass from the front to the back thereof, over the fire. Sixthly, I claim, applying the pipes or tubes, for the admission of air to the fire-place of locomotive and other similar boilers, by placing them within the smoke or exhausting-box, and also within the boiler, as well as around the fire-box. I also comprise within this claim, the method of applying air pipes, tubes, or flues, within other boilers, to convey the air through them, in a similar way to the furnaces or fire-places, as above described. Seventhly, I claim the application of an apparatus, consisting of pipes and valves, for the two following purposes; videlicet, first, to direct a current of steam from the boiler up the chimney of locomotive engines, when such engines are stopping, in order to keep up the combustion of the fuel, by producing

a draught of atmospheric air between the fire-bars and through the fire; and secondly, passing steam into tubes or pipes, placed in the tender for the purpose of heating the water therein contained, and thereby prevent the waste of fuel, which takes place at present when the engine is not in action. Eighthly, I claim surrounding the smoke or exhausting-box with a space containing water. I only claim this part of the invention, when used in conjunction with the apparatus above described, for supplying heated air to the fire-place or furnace. Ninthly, I claim the method of preventing large pieces of fuel from escaping from the fire-place into the chimney, by means of a perforated metallic plate, as above described."

The patentee says in conclusion, "I may here observe, that I do not confine myself to the precise apparatus and means hereinbefore described, delineated, and claimed, as many alterations may be made therein, which as substantially and essentially comprise my improvements as those hereinbefore described and delineated."—[*Inrolled in the Inrolment Office, July,* 1841.]

To William Henry Fox Talbot, *of Locock Abbey, in the county of Wilts, Esq., for improvements in obtaining pictures or representations of objects.*—[Sealed 8th February, 1841.]

As any improvement on or relating to the Daguerreotype process, for obtaining representations of objects, by means of the camera obscura, is at the present viewed with considerable interest, we shall endeavour to give as clear and as perfect an account of the present invention as possible.

The first part of the invention is for making paper ex-

tremely sensitive to light; and for this purpose the best writing paper is selected and prepared in the following manner:—Paper having a smooth surface and a close and even texture should be chosen, and one side thereof washed, by means of a soft camel's-hair brush, with a solution composed of 100 grains of crystallized nitrate of silver, dissolved in six ounces of distilled water. A mark must be made of that side of the paper that has been washed, in order to know it again; and it should be dried very cautiously at a distant fire, or allowed to dry spontaneously in a dark place. When dry, the paper is immersed in a solution of iodide of potassium for a few minutes;—the solution consists of 500 grains of this salt, dissolved in one pint of distilled water. After this, the paper is taken out and dipped in water, and then dried, by applying blotting paper lightly to it, and afterwards exposing it to the heat of a fire, or allowing it to dry spontaneously.

It is preferable to do this process in the evening, by candle-light, as there is less intensity of light, and therefore the paper is not so liable to be spoiled. The paper thus prepared, is called iodized paper; and although it is scarcely sensitive to light, yet it should be carefully kept in a portfolio, or some dark place, until required for use. It does not spoil by keeping any length of time, if this is carefully attended to, and it is not exposed to light.

When the iodized paper is required for use, a sheet is taken from the portfolio, and washed with the following solution:—100 grains of crystallized nitrate of silver, dissolved in two ounces of distilled water, and add to this one-third of its volume of strong acetic acid; then dissolve a small quantity of crystallized gallic acid in distilled water, and mix the two solutions together in equal proportions, and in no greater quantity than is required for immediate use, as it will not keep good long. The patentee calls this

mixture "gallo-nitrate of silver;" and he applies it to the iodized paper by means of a soft camel's-hair brush, on that side which has been previously marked. This operation should also be performed by candle-light; and after allowing the paper to remain half a minute to absorb the gallo-nitrate of silver, it should be dipped in distilled water, and dried lightly, first with blotting paper, and then by means of a fire, holding the paper at a considerable distance therefrom. When dry, the paper is fit for use; and it is advisable to use it within a few hours.

The paper thus prepared, the patentee calls "calotype paper," and it is placed in the camera obscura to receive the image formed in the focus of the lens. While being placed in the camera, and adjusting the same, the paper must be defended from the light by a screen; which, when every thing is properly arranged, may be withdrawn, so as to expose the paper to the light which enters the camera, and thereby receive the image.

If the object is very light, or the duration of the operation sufficiently long, a sensible image is seen on the paper when removed from the instrument; but if the time is short, or the objects dim, no image whatever is visible, and the paper appears entirely blank. An invisible image is, however, impressed upon the paper, and is made visible in the following manner:—Take some of the gallo-nitrate of silver above mentioned, and, with a soft camel's-hair brush, wash the paper all over with this liquid; then hold it before a gentle fire, and in a short time the image will begin to appear; and those parts upon which the light has acted most strongly, become brown or black, while the others remain white. The image continues to grow more and more distinct for some time; and when it becomes sufficiently so, the operation must be terminated, and the picture fixed; and in order to effect this, the paper must be dipped

first into water, then partly dried by blotting paper, and afterwards washed with a solution of bromide of potassium, consisting of 100 grains of the salt, dissolved in eight or ten ounces of water. The picture is then again washed in water, and finally dried as before. In place of bromide of potassium, a strong solution of common salt may be used.

The lights and shades of the picture thus obtained, will be reversed; that is, the lights of objects will be represented by shades, and the shades or dark parts by lights; but it is easy to obtain a second picture from the first, so as to produce a picture which is conformable to nature; that is to say, with the lights represented by light parts, and the dark places by shades. In order to do this, a second sheet of calotype paper is placed in close contact with the first; and a board being placed beneath them, and a sheet of glass above, the whole is pressed in close contact by means of screws, or in any other convenient manner. Then, by placing them in the sunshine or daylight for a short time, an image or counterpart of the picture, is formed on the second sheet of paper, but with the lights and shades properly arranged. The image is sometimes invisible at first, but it may be made to appear in the manner above stated.

The patentee does not recommend that the copy should be taken on calotype paper, but on common photographic paper, which is prepared by washing good writing paper, first with a solution of common salt, and then with a solution of nitrate of silver. On whatever paper the copy is taken, it should be fixed in the manner above explained; and after a calotype picture has furnished a good many copies, it sometimes becomes faint, and the latter pictures are inferior. In order, therefore, to revive the strength of the original, it is only necessary to wash them again by candle-light with gallo-nitrate of silver, and then warm

them. The shades of the picture are by this means considerably darkened, while the white parts remain unaffected. After this process, the picture requires fixing a second time, and it will then yield a second series of copies; and, if required, a great number may be frequently made. A photographic picture, taken on other kinds of sensitive paper, may be strengthened and revived in the same manner; but they are inferior in beauty, and the result is less to be depended on; the patentee, therefore, does not recommend them.

The next part of the invention consists in a mode of obtaining positive photographic pictures, in which the lights are represented by lights, and the shades by shades. We have already explained how this is done, by a double process; we shall now proceed to describe the method adopted by the patentee, for doing it in one single process:—

A sheet of sensitive calotype paper is exposed to the daylight for a few seconds, or until a visible discoloration or browning of its surface takes place; then it is to be dipped into a solution of iodide of potassium, consisting of 500 grains to one pint of water. The visible discoloration is apparently removed by this immersion; such, however, is not really the case, for if the paper were dipped into a solution of gallo-nitrate of silver, it would speedily blacken all over. When the paper is removed from the iodide of potassium, it is washed in water, and then dried with blotting paper. It is then placed in the camera obscura, and after five or ten minutes, it is removed therefrom and washed with gallo-nitrate of silver, and warmed, as before directed. An image of a positive kind is thereby produced, and represents the lights of objects by lights, and the shades by shades, as required.

Engravings may be copied in the same way, and positive copies of them produced, but reversed from right to left.

For this purpose, a sheet of calotype paper is exposed to the day-light to darken it, as before mentioned; but it should be darkened rather more than when intended to be acted upon in the camera. The engraving and the calotype paper must be pressed into contact by screws or otherwise, and placed in the sunshine, and the copy will be produced in a few minutes. If the copy is not sufficiently distinct, it must be strengthened by means of gallo-nitrate of silver, as before described.

The patentee says, "he is aware that the use of iodide of potassium has been recommended by others, for obtaining positive photographic pictures; he therefore does not claim it when used by itself, but only when employed in conjunction with gallo-nitrate of silver, or when the pictures obtained are rendered visible or strengthened subsequent to the first formation."

In order to obtain portraits from life, the inventor prefers a camera, the focal length of whose lens is not more than three or four times the size of the aperture; and the head of the person whose portrait is to be taken, must be kept as steady as possible; and, upon pointing the camera at it, an image is received on the sensitive calotype paper.

The inventor prefers carrying on the process in the open air, under a serene sky, and without sunshine; and the image is generally obtained in half a minute. If sunshine be employed, a screen of blue glass should be used to defend the eyes from too much glare. This coloured glass does not materially weaken the power of the chemical rays, to affect the paper. The portrait thus obtained on the calotype paper, is a negative one; it must, therefore, be reversed, as above explained.

The claim of novelty made by the patentee is, first, employing gallic acid, or tincture of galls, in connection with a solution of silver, for the purpose of rendering paper

(that has been previously prepared) more sensitive to light; secondly, making photographic images visible on paper, and strengthening and reviving such images (when only imperfectly seen) by operating upon them with liquids, which act upon those parts of the paper which have been previously acted upon by light; thirdly, producing portraits from life upon paper by photographic means; fourthly, the employment of bromide of potassium, or some other soluble bromide, for the purpose of fixing the images.

The next part of the invention is for a method of obtaining photographic images upon copper. To effect this, the patentee takes a polished copper-plate, and exposes it to the vapour of iodine or bromine, or the two substances combined, or either of them in combination with chlorine. Or the copper-plate may be immersed in a solution made by dissolving one of the above-mentioned substances in alcohol, or some other solvent. By this means, the polished surface of the copper becomes sensitive to light, and a photogenic image may then be obtained in the ordinary manner. When the plate has remained long enough in the camera, it must be exposed to the vapour of sulphuretted hydrogen, or one of the liquid hydrosulphurets. This vapour produces various colours on the plate, according to the intensity with which the light has acted on the different parts; consequently, a coloured photogenic picture is obtained. No further process, for fixing the image, is required, as a subsequent exposure to the light does not affect the picture.

Other vapours or liquid solutions, which colour the sulphuret of copper, may be employed instead of the sulphuretted hydrogen; such, for example, as iodine, bromine, or chlorine, may be used, but with less advantage. In reference to this part of the invention, the patentee claims the methods above described, of rendering copper sensitive to

light; and also the mode of colouring the photogenic image, and rendering it permanent by subsequent exposure to vapours or liquids, which act with different effects on those which have or have not been exposed to the action of light.

The next part of the invention is described as follows:— A smooth surface of steel, platinum or other metal, is covered with an extremely thin layer of silver, which is then made sensitive by any of the known methods, and a photogenic image is obtained. The plate, with the image thereon, is then placed in a horizontal position, and a solution made of acetate of lead, dissolved in water, is then poured upon it. Then, by passing a galvanic current through the plate and solution, a coloured film is precipitated upon the plate. The claim to this branch of the invention, is for the application of coloured films, produced by a solution of lead, acted upon by a galvanic current, for the purpose of producing coloured or otherwise diversified photogenic images.

The next part of the invention consists in producing very thin plates of silver, for the purposes of economy, in photographic processes; and also for greater convenience when travelling. In order to effect this, a thin layer of copper is precipitated by the electrotype process, on to a polished metal plate; a sheet of paper or card is then glued or cemented to the back of the copper, and when dry, the paper is removed, with the layer of copper adhering to it; the copper is then silvered by immersing it in a solution of silver.

The last part of the invention consists in transferring photogenic images from paper to metal. For this purpose, the metal surface is made sensitive to light, and the paper photograph is placed on it, with a sheet of glass in front, and the whole is pressed by screws in firm contact, and exposed to the sunshine. A photograph on metal is thereby produced, and is afterwards fixed or otherwise treated, according to the effect required.

The method of transferring the image on one sort of sensitive paper to another sort of paper, has been already described; and the patentee claims the transferring photogenic pictures, obtained on sensitive paper, to metal surfaces, or to a different sort of sensitive paper; and in conclusion he says, "I do not confine myself to the precise weights and measures of the substances employed in these processes, as they may be varied, according to circumstances; but I have mentioned those which I have found to be, on the whole, most convenient.—[*Inrolled in the Inrolment Office, August*, 1841.]

To Richard Laming, *of Gower-street, Bedford-square, in the county of Middlesex, surgeon, for improvements in the production of carbonate of ammonia.*—[Sealed 15th March, 1841.]

To obtain the salt, which, in commerce, is called carbonate of ammonia, either animal matters are subjected to destructive distillation, or a mixture of carbonate of lime and some ammoniacal salt, is exposed to a high temperature; the carbonate of ammonia is, by this means, volatilized, and it is usually passed into condensing vessels or chambers, in which it accumulates, either in a concrete state, or more or less dissolved in water.

Now, by my improved process, instead of distilling an ammoniacal carbonate, direct from any substance or mixture capable of supplying it, I obtain the salt, either in a solid state, or dissolved more or less in water, by mixing together its separate acid and alkaline constituents; and these are the improvements which I claim as my invention.

One of the processes, which I use for this manufacture, is to cause ammonia gas and carbonic acid gases, (obtained separately from any convenient sources,) to traverse a succession of leaden chambers, maintained at as cool a temperature as may be conveniently practicable, and so contrived as to favor the admixture of the dissimilar gases. In this process, it is not essential that the two gases be present in their combining proportions; it is preferable that the carbonic acid be in greater abundance than will combine with the ammonia which is present.

Sometimes I place in one or more of the chambers a stratum of water, or of water impregnated with ammonia, and then introduce to it carbonic acid and ammonia gases, or carbonic acid gas; in which cases, I am enabled to obtain in the resulting salt, or saline solution, a larger proportion of carbonic acid gas than when only the hygrometric moisture of the æriform fluids is present.

I do not restrict my claim to any particular forms or construction of apparatus; but I claim the invention of making carbonate of ammonia, by mixing its acids and alkaline constituents in any convenient apparatus; in all cases, in which those constituents are obtained by different processes, or supplied from different vessels, and whether they be pure, or more or less mixed with air or other gases or matters.

When carbonate of ammonia, which has been mixed with other substances, for any purpose in the arts, is to be recovered by exposing the mixture to a high temperature, it may be thought to save ammonia by condensing the salt in a chamber or vessel containing carbonic acid gas.—I therefore, disclaim as any part of my invention, the use of carbonic acid gas, for the purpose either of recovering or preventing the loss of carbonate of ammonia; my invention having for its end, only the first production of carbonate of ammonia.

When carbonate of ammonia is made by the ordinary processes of distilling animal matters, or a mixture containing an ammoniacal salt, it may be thought to conduce to a greater product to maintain the condensing chambers full of carbonic acid gas; but I do not claim, as any part of my invention, the use of carbonic acid gas, for increasing the quantity of carbonate of ammonia to be obtained by any of the ordinary process of distillation.

The carbonate of ammonia, usually met with in commerce, is called, by chemists, sesqui-carbonate of ammonia; besides this, there is a second variety, containing a lesser proportion of carbonic acid, called, by chemists, carbonate of ammonia; and also, a third, which contains a larger proportion of carbonic acid, and which chemists name the bi-carbonate of ammonia.

Now, I do not claim, as any part of my invention, the conversion of the carbonate of ammonia into the sesqui-carbonate or the bi-carbonate, nor the conversion of the sesqui-carbonate into the bi-carbonate, by exposing the carbonate or the sesqui-carbonate in solution to carbonate acid gas; but I claim, as my invention, the formation of these several salts, or varieties of salt, or any mixture of them, by the exposure of carbonic acid gas to ammonia, in solution, either alone or mixed with one or more of the carbonates of ammonia.—[*Inrolled in the Rolls Chapel Office, September,* 1841.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 138, Vol. XIX.)

March 9, 1841.

The PRESIDENT in the Chair.

"Description of a Bridge for a Railway crossing above a Turnpike Road, where the depth between the soffit of the Bridge and the surface of the Rails is limited to twenty-one inches."

By John Pope, Grad. Inst. C. E.

This bridge was designed by Mr. W. Cubitt, V.P., to meet the conditions of a clause in a Railway Bill, which required that there should be a clear width of opening for headway through the bridge in every part, 30 feet wide by 20 feet high, whilst at the same time the height of the embankment limited the space between the under side of the bridge and the surface of the rails to 21 inches.

The railway is carried on three cast-iron girders, each 3 feet deep at the centre, diminishing to 6 inches at each end, with a bearing of 2 feet on cast-iron wall-plates, supported by brickwork abutments. The flanches of the girders are 8 inches wide, and the metal everywhere 2 inches thick. Balks of Memel timber, 12 inches square, are laid transversely, close jointed, their ends bearing upon the flanches of the girders; on these timbers the chairs are fixed, and the rails are laid. The whole depth employed is—

The flanch of the girder........	2 inches
Thickness of timber balks	12 „
Depth of the rail and chair......	$6\frac{1}{2}$ „
	$20\frac{1}{2}$ inches

One of the girders on each side supports the parapet wall in which it is completely encased, and being faced with cut stone, assumes the appearance of a flat camber arch, 3 feet in depth.

A detailed drawing, showing minutely the construction, accompanied this communication.

"Description of the Arched Timber Viaducts on the Newcastle and North Shields Railway, erected from the designs of Messrs. John and Benjamin Green; and on the application of the same system of construction to oblique and other Bridges, to the Roofs of Railway Stations, and to other large Buildings."

By Benjamin Green.

The construction of viaducts and bridges forms so important an item in the cost of a railway, that the engineer is induced to devise new methods of completing his works with due regard to stability and durability, and at the same time with the least possible expense. Stone and brick have been the materials most generally used for bridges; cast-iron has been introduced where the heights were too low for the spans, in large arches, or in trussed beams where a certain clear space beneath was required, with only a limited height to the level of the rail. Timber, from its lightness, strength, and cheapness, has been extensively used, but only in spans of limited extent, owing to the sole mode of its application being by framed trusses, upon the same principles as those usually employed for roofing.

These considerations induced Mr. John Green, as far back as the year 1827, to make a design and model for a bridge, with timber arches resting upon stone piers. In 1833 the plan was adopted, and in 1837 it was put into execution at the Ouse Burn Viaduct, where the construction was of great extent, and the cost was an important consideration.

The Viaduct is 918 feet in length, and 108 feet in height from the bed of the river. There are five arches, the versed sine 33

feet, and the radius 68 feet; three of them are 116 feet span each, and two are 114 feet each: two stone arches of 40 feet span each have been introduced at each end to give length to the abutments, and to prevent the embankments from being brought too near to the steep sides of the ravine. The piers are of stone; the springing stones for the three ribs, of which each arch is composed, are on offsets, within 40 feet of the top of the piers; cast-iron sockets are there bedded in the masonry, and secured so as to receive the feet of the ribs. Two of the piers are placed upon piles; the others are founded upon the rock: immediately beneath the centre of one of them an old coal-pit shaft was discovered, and close adjoining it the remains of the working of a coal seam; both were rendered secure by being filled up with grouted rubble masonry.

The ribs for the arches are composed of planks of Dantzic deal (Kyanized): the lengths vary from 46 feet to 20 feet, by 11 inches wide and 3 inches thick: they are so disposed, as that the first course of the rib is two whole deals in width, the next is one whole and two half deals, crossing the joints longitudinally as well as in the depth. Each rib consists of fourteen deals in thickness, bent over a centre to the required form, and secured together by oak treenails 1½ inch diameter at intervals of 4 feet apart, each treenail traversing three of the deals. A layer of strong brown paper dipped in boiling tar is placed between the joints, to bed them and exclude the wet. Trussed framings and beams are secured upon the arched ribs; the platform composed of planks, each 11 inches wide by 3 inches thick, is spiked down and covered with a composition of boiling tar and lime mixed with gravel in laying on, forming a coating impervious to the wet; upon this platform the two lines of railway are laid, leaving a foot-path between them.

The centreing for turning the ribs was very light and simple, and as every convenience was afforded by having a railway with travelling cranes along the sides of the piers, a whole centre could be moved by twenty men from one arch, and fixed in another in one day.

The author then describes the construction of the Willington Viaduct, and that which has been erected by him at Dalkeith for the Duke of Buccleuch; giving the relative costs of the three structures which have been mentioned, and stone buildings of the same dimensions: whence it appears that in the Ouse Burn Viaduct there was an economy of £9000. resulting from the adoption of this system.

He then shows the application of this system to the structure of oblique bridges, particularly where a certain clear space is required beneath, and the total height is limited: this is illustrated by a description of a bridge of 71 feet span, on the Newcastle and North Shields Railway, which crosses the turnpike road at Walker, and by one erected over the River Wear on the West Durham Railway.

He describes also the application of the same system to the extensive buildings and sheds of the Shields Railway Station; to churches and to private houses; in the latter the arched form is very advantageous in gaining space for the upper rooms, showing at the same time the economy resulting from the adoption.

The paper is illustrated by a series of nine elaborate detailed drawings, shewing the application to every kind of construction.

Mr. Rendal remarked, that on those railways where first cost was a matter of importance, the introduction of a superior kind of Timber Bridge was a great desideratum. The communication proposed the application of tarred paper between the joints: from experience he could not recommend either paper or felt in such situations. He found that both substances prevented the intimate contact of the surfaces of the timber; in all framings exposed to the action of weather the tar was absorbed by the wood; the paper and felt then became saturated with and retained the moisture, so that decay very speedily ensued. The mode he at present adopted was to have all the joints and mortices of the framings very closely fitted, leaving only sufficient space at the edges to be caulked with oakum, and the joint run with pitch,

like the seams of the deck of a vessel. Wherever it was practicable, great advantage would result from covering the joints with sheet lead, to exclude the moisture and prevent the decay, which was the great bar to the more general use of timber in many engineering works.

Mr. Vignoles was inclined to think the curve of the arch was too steep; he should prefer its being flatter. He would not then enter into the subject, but he would present to the Institution a large model of a Timber Bridge, and with it a communication, explaining his views on this subject, which was one to which he had paid much attention.

Mr. Macneil had found constant trouble to result from the decay of wooden bridges. The Dalmarnoch Bridge, which had been erected about thirty years, now demanded continual repairs; the struts were nearly all decayed at the points of insertion into the cast-iron sockets. The original floor had been replaced by one of teak wood.

In answer to a question from the President as to the process of "Kyanizing" timber for the Hull and Selby Railway, Mr. Timperley describes the method pursued there. In a close cylindrical wrought-iron vessel, 70 feet long and 6 feet diameter, filled with a solution of corrosive sublimate, the timber was piled, leaving a space along each piece; the air was then exhausted by air-pumps to a vacuum of about 25 inches by the mercury gauge, and by the application of a force-pump, under a pressure of 100 lbs. per square inch, the solution was driven into the pores of the timber. From experiments he had made he believed that the timber was thus thoroughly saturated, and although sufficient time had not elapsed to give any correct result as to the comparative duration of the sleepers, he thought very favourably of the process.

The original cost of the timber, which was the best Riga Balk, squared, was £5. 10s. per load (50 cubic feet.) The expense of "Kyanizing" about 400,000 cubic feet, including the interest of the first cost of the apparatus, was between fourpence and fivepence per cubic foot. The process was carried on with greater

rapidity, and much more effectually, than it could have been done in open tanks.

Mr. Lowe was of opinion, that although the mechanical part of this process appeared very effective, it was not really so. There were chemical difficulties: a certain length of time was required to dilute and extract the sap and aqueous matter from the pores. The greater or less duration of the process might in some measure account for the difference of the results practically obtained. Dry planks succeeded better than wet ones; with sound dry timber any solution of the metallic salts, such as the sulphates of iron or copper, was efficacious, but with wet timber he doubted whether any preparation would be effectual.

Mr. Cooper believed that in the process of "Kyanizing" the chlorine united with the albumen, and formed chloride of albumen; it was possible that in the exhausting process the air contained in the timber would expand and prevent the capillary tubes from becoming perfectly saturated with the solution of corrosive sublimate.

March 16, 1841.

The President in the Chair.

"Description of the Methods adopted for raising and sustaining the sunken Roof of St. George's Church, Dublin."

By Robert Mallet, Assoc. Inst. C. E.

St. George's Parish Church, one of the finest ecclesiastical edifices in the city of Dublin, was completed in the year 1802, from the designs of the late Francis Johnston, Architect to the Board of Works at that time, at a cost of about £90,000.

The church had not been built many years, before the roof, which was covered with tun slating and copper, gradually sunk in several places, by which the cornices at the flank wall were pushed several inches outwards. The subsidence slowly but continually increased. The ceiling cracked in various places, the ornamental stucco work began to drop off, and in the year

1836 the state of the roof was such, that the church was deemed unsafe for use, and was shut up.

Messrs. John and Robert Mallet were consulted as to the practicability of restoring the roof. In November 1836, they reported that they considered the ceiling might be preserved, and described the manner in which they proposed to accomplish it.

The mode proposed consisted in interweaving with and adapting to the timber framing of the roof, a system of metallic framing, so arranged, that all strain or stress should be removed from the former, and borne by the latter, as well as removing all lateral pressure from the walls of the building.

A careful survey of the roof showed that the ends of several of the principles were unsound. A small hole was then bored through the ceiling, close to each queen-post, and a deal rod, $\frac{1}{2}$ an inch square, dropped through each. These rods were all of equal length, and their upper ends were secured level with the top surface of the tye-beam of each principal; then with a levelling instrument placed in the gallery, observations were taken, and the exact amount of the deflection of the framing ascertained. The variation was considerable, but the greatest amount of depression was found to be $5\frac{7}{8}$ inches. The whole roof was strained and distorted, and was so unsafe that the slightest effort caused vibration throughout.

The causes of this failure appeared to be threefold; a radical want of strength in the framing of the roof; secondly, the employment of unfit tye-beams, which having been constructed during the continental war, when timber was scarce and dear, were formed almost wholly of short lengths, averaging not more than 20 feet, lapped and scarfed; thirdly, in the queen-post having been badly constructed and ill placed.

The stone corbels, which supported the oak cantilevers, being originally cut almost through to receive the wall-plate, were nearly all broken in the middle. It was proposed, therefore, to remove the oak cantilevers and stone corbels, and to cut away the timber wall-plate beneath each principle, to level up the wall, placing a suitable cast-iron abutment piece at each end, and to

spring from side to side a cast-iron arch, in "double flitches," connected through the spaces of the timber framing by hollow distance pieces, and also by a certain number of equidistant cross-heads, from which should drop down vertical suspending rods, capable of being adjusted in length, and connected with the tye-beam of the principle, so that being drawn up straight, and the respective parts secured, the weight of the whole roof would be transferred through the framing to the tye-beams; whilst they being hung from the system of suspension rods of the cast-iron arches, which would thus sustain the whole load, and their abutments being held together by the tye-bars in the chord line, the load would bear vertically upon the walls.

It was then determined to raise the roof and ceiling by forces applied from below; to cut away the rotten ends of the principals and to reconnect them with the walls by a modification of the cantilever bracket, invented by Mr. Alfred Ainger, and described in the Transaction of the Society of Arts. (vol 42.) The whole of the oak cantilevers and stone corbels were to be removed as useless incumbrances.

The total weight of the roof being about 133 tons, each framed principal would sustain about 16½ tons, and each vertical suspending rod about 1½ ton.

Although the weight of material in this roof and ceiling may be considered uniformly distributed, it was impossible to foresee what change might be effected in the framing by forcing the ceiling and roof up to a level line, or what amount of force might bear upon particular points, from the elasticity of the materials being thus forcibly constrained. It hence became a matter of prudence to provide in all parts a large surplus of strength, bearing in mind that, in any complete system, "the strength of the whole is limited by that of the weakest part, and thus that partial strength becomes total weakness." The dimensions of the scantling were accordingly so calculated that the utmost strain upon it should not exceed 4·5 tons per square inch, considering 9 tons to be the practical limit to which wrought iron might be exposed.

After giving the formulæ for calculating the strains upon the

different parts of the roof, with the reasons why the theoretical dimensions were in some instances departed from, the author apologises for entering so much into detail of the construction, quoting at the same time the writings of Smeaton and Telford, as abounding in the richest details of theoretic deduction, modified by practical judgment. He then proceeds to describe the means adopted.

Immediately beneath each of the fourteen queen-posts of the roof, an aperture of 30 inches square was cut through the floor of the church, and a pier of brick and cement built up from the arches of the vaults beneath to the level of the floor; on the top of each, a plate of cast iron was bedded, and upon each plate a block of oak timber about 4 inches thick.

Fourteen straight whole balks of Memel timber, each 3 feet shorter than the height of the church between the floor and the ceiling, with their extremities cut square and smooth, were placed vertically upon the blocks; upon this level a platform was laid; across the tops of the vertical balks, pieces of oak scantling were placed; fourteen powerful screw-jacks were then fixed, one beneath each queen-post, and the ceiling cut away for the points to bear directly upon the beams.

During the progress of these operations, the whole of the ceiling and roof framing had been carefully examined. The dust was removed from the joints and open mortices, &c., of the framing, and the cracks in the ceiling were cleared out by passing a fine whip-saw through them, so as to permit their closing when the ceiling was raised to a plane surface.

The preparations being completed, the word was given to heave simultaneously upon the screw-jacks; the roof rose slowly and steadily, and as soon as any one of the small deal standard rods had reached the level plane, the motion of the screw-jack at that spot was stopped. In about two hours, the whole roof, together with the ceiling, was brought up level, without any accident or injury to any portion of the ceiling. The cracks in the in the latter as well as the joints and mortices of the framing were found to be nearly all closed. Some slates were broken,

and the copper of the platform, which before was wrinkled and loose, was now found to be drawn tight over the timber sheathing.

The roof being thus supported from beneath, the masonry was cut out round the ends of the principals; the oak cantilevers and corbels of granite, and the rotten ends of the timbers, within a few inches of the inside face of the walls, were also removed.

The cantilever and abutment castings were now applied and bedded with lead and oil putty, on blocks of stone, set at the level of the under side of the tye-beams, on footings of brick and cement. The chord bars were next placed, and temporarily adjusted by means of their screw-nuts. The arch segments were put up in succession, their centre or key-pieces bolted in, and the segments adjusted to them by means of wedges of African oak: the suspending rods were then hung on from the top shackles, and the junction made good with the tye-beams, by means of the lower cross-heads, stirrups, and shackles.

As soon as the whole system of the seven arched frames was complete, and the cantilevers adjusted to the ends of the decayed timbers, standing lengths of pine rods were placed in right lines from centre to centre of each pair of abutment cross bolts, and all the chord bars and suspending rods were brought up by means of their adjustment screws, until the united effort of the whole system had lifted and supported the entire roof and ceiling from the screw-jacks, on which they had previously rested, so that these latter all became loose.

The whole was now left quiet for some days, in order that every part might take its bearing, and that the sufficiency of the structure should be proved before the final removal of the screw-jacks, &c., which remained within about one-eighth of an inch of the blocks beneath the tye-beams, by which means, in case of accident, the amount of fall would have been limited to that small distance. The entire work, including the repairing the cracks in the ceiling, occupied little more than four months, and has never since required either alteration or repair.

The total amount of the contract for this work was £1362. 6*s*. The repair of the injury done to the ceiling only amounted to

£33. 0*s*. 8*d*., and the damage done to the slating, platform, flooring, &c., did not amount to more than an equal sum.

The total amount of cast and wrought-iron in the structure was 21 tons 10 cwt. 2 qrs. 19 lbs.

The communication is illustrated by five elaborate drawings on a large scale, showing the general arrangement and modes of proceeding, and also the details of the construction of the roof, and of the cast and wrought-iron works used in the repairs.

"Description of two Wrought-Iron Roofs over the buildings at Mr. Thomas Cubitt's Works, Thames Bank."

By Mr. Adams.

This communication describes in detail the construction, and gives the dimensions of the several parts of two fire-proof roofs of 29 feet span, one of which bears, in addition to the covering, a ceiling of tile arches upon iron girders, the weight of which is equal to 5 tons 4 cwt. upon each truss.

The paper is accompanied by 2 drawings of the roofs.

"Description of a Double Telescope Theodolite."

Arranged by Nathaniel Beardmore, Grad. Inst. C. E.

The improvement in this theodolite consists in its having a second telescope fixed over the ordinary one, in a reverse position, so that the line of collimation of the two telescopes, when properly adjusted, should be the same. The principal advantage gained is, that a straight line may be carried out with perfect accuracy, without the tedious and uncertain process of adding 180 degrees to the observed angle and reversing the instrument.

A drawing of the instrument accompanied the communication.

"On setting out Curves for Railways."

By R. C. May, Assoc. Inst. C. E.

The method of setting out curves, proposed in this communication, is founded upon the 32d Prop. of the 3d book of Euclid. It consists in cutting off by a chord, a segment of the circle to be described, and then finding any number of points in the curve by means of a reflecting instrument, which is set so as to reflect the angle in that segment.

The instrument which has been adapted by the author for this operation, consists of two plane mirrors, the upper one being fixed vertically upon a disc of brass, and the lower one fastened to an arm, which turns upon its centre, and permits the two mirrors to be set at any angle with each other: the arm can be fixed by a clamp-screw. In the case surrounding the mirrors are two holes, for admitting light, and between them is the sight hole, placed so as to bisect the angle formed by the mirrors. From the underside, at the centre of the instrument, is suspended a slender wooden rod, with a pointed end, weighted with lead.

Angles are taken with the instrument in the same manner as with the box sextant. To determine any point in the curve, the instrument when set fast is placed in such a position that the two given objects coincide in the mirrors, and the weighted rod being released by withdrawing a bolt, falls directly beneath the centre of the instrument, marking the required point in the curve.

The author presented with this paper a Reflecting Instrument, and field tables of chords and segments to be used in setting out curves by this method.

March 23, 1841.

The President in the Chair.

"An improved Plank Frame, for sawing Deal Planks of various thicknesses into any number of boards."

By Benjamin Hick, M. Inst. C. E.

The principal improvement in this machine is a novel kind of

gearing for producing what is usually termed the "taking-up" or "traversing motion" of the plank during the operation of sawing.

A revolving motion is given to two pair of coupled vertical fluted rollers, by means of worms and wheels, which are worked by a ratchet wheel and catch, from the crank shaft of the machine. When a plank is introduced between the moving rollers and the fixed guides in the centre of the machine, the tendency of the motion is to draw the plank forward at each stroke, with a force exactly corresponding to the degree of resistance opposed by the teeth of the saw. By this means, the necessity of any other support or side roller to the plank, during its progress through the machine, is avoided, and any number of planks of different length, depth, and thickness, can be put through the machine after each other, without any alteration or stoppage of the work.

Several minor improvements are introduced in the general arrangement of the machine, particularly in the position of the crank shaft and connecting rod, which latter is placed in the centre of the moveable frame, occupying a space which has not hitherto been made use of in machines for cutting two planks simultaneously; and by carrying the crank shaft upon the framing, instead of having it fixed upon a separate foundation, the construction is simplified as well as rendered less expensive.

The communication was accompanied by a working model of the machine.

"An historical Account of Wood Sheathing for Ships."
By J. J. Wilkinson.

This communication commences with the earliest history of naval architecture, the different modes of construction, and the precautions taken for the preservation of the vessels from the attacks of marine animals.

A very early instance of extraordinary attention to the preservation of the bottom of a vessel, appeared in a galley supposed

to have belonged to the Emperor Trajan, A. D. 98 to A. D. 117, which was found in the fifteenth century in the lake Hemorese (or Lago Riccio), in the kingdom of Naples, and was weighed after it had probably remained more than 1300 years under water; it was doubly planked with pine and cypress, coated with pitch, upon which there was a covering of linen, and, over all, a sheathing of lead, fastened with nails of brass or copper; the timber was in a perfectly sound state.

In the reign of Henry VIII. large vessels had a coating of loose animal hair attached with pitch, over which a sheathing board of about an inch in thickness was fastened "to keep the hair in its place."

It is believed that the art of sheathing vessels was early practised in China: a mixture of fish oil and lime was applied; it was very adhesive, and became so hard that the worm could not penetrate it.

The opinions of Sir Richard Hawkins, of François Cauche, and of Dampier, on the practice of wood furring, are then given at length, with extracts from their journals.

The sheathing the bottoms of ships with timber, appears to have been disapproved by these early navigators. In 1668, the officers of the fleet, then preparing under Sir Thomas Allen for an expedition against the Algerines, petitioned that their vessels might not be thus encumbered, as they were in consequence always unable to overtake the light-sailing unsheathed vessels of the enemy; the petition was granted, upon the condition that precautions should be taken by cleaning the ships' bottoms very frequently.

In 1670 a patent was granted to Sir Philip Howard and to Major Watson, for the use of milled lead sheathing; it was not, however, introduced without difficulty; nor until an order was issued that "no other than milled lead sheathing should be used on his Majesty's ships." About the year 1700 the lead was acknowledged to have failed, and wood sheathing was again introduced.

Numerous instances are given of the employment of wood as

sheathing for ships in celebrated expeditions: the ravages of the worm, the accumulation of barnacles and weeds, are then described; the qualities of the wood employed for sheathing in different countries, both formerly and up to the present time, are examined, and the author, who undertook the investigation of this subject in consequence of finding how little good information existed in an accessible form, promises the history of metal sheathing in a future communication.

"A Machine for bending and setting the Tire of Railway Carriage Wheels."

By Joseph Woods, Grad. Inst. C. E.

The usual mode of bending tire bars was by means of swages and hammers round a fixed mandril; after being welded, they were stretched on a cast-iron block, formed of two semicircular pieces, hinged at one point, and wedged apart at the opposite side; the hoops being heated, were placed on this block, and by repeated blows driven into close contact with the mould.

Much difficulty was experienced in thus making up tires for large railway wheels, and the present machine was constructed for facilitating the process.

One end of the tire bar, when heated, is wedged into contact with one of four segments of a circle, of the required diameter, upon a cast-iron table, which is caused to revolve slowly; the pressure of a guide wheel at one side forces the tire bar to warp round the segments, and to form the circular hoop required; its ends having been previously scarfed, are then welded together.

The tire is again thoroughly heated and placed around the four segments, which slide radially on the table, and are then simultaneously forced outwards by a motion of the centre shaft.

The tire being slightly chilled, and assisted by the swage and hammer, soon adapts itself to the segments, and forms a circular hoop instead of two semi-circles irregularly joined at their points of contact, as by the old system; it is then ready for being

chucked on the lathe, and bored out before shrinking on the wheel.

It is apparent that a machine of this description becomes applicable to tires of any diameter, by having three or four sizes of segments adapted to the table. It is found to diminish the manual labour, and to prepare the tire more accurately than by the usual process.

A model of the machine, and a detailed drawing of the several parts, accompanied the communication.

"On the improvement of the Roads, Rivers, and Drainage, of the Counties of Great Britain."

By Robert Sibley, M. Inst. C. E.

The author had on a former occasion drawn the attention of the Institution to the subject of a Bill before Parliament, "for the better regulation and general improvement of the Drainage of the Country;" and at the same time pointed out the course pursüed by the magistrates of the County of Middlesex, in procuring with his professional assistance, an accurate account of the Rivers, Bridges, &c., hoping that it might lead to similar surveys in other counties.

In the present communication he investigates the nature of the works which each county may be expected to undertake, and the means of accomplishing them economically, so that real public benefit may accrue.

The objects principally requiring the attention of the county magistrates, he considers to be, First—Facility of intercourse by the improvements of the roads, bridges, rivers, and canals; Secondly—Protection from injury by the passage of the waters from or through the county; and Thirdly—The removal of causes tending to vitiate the atmosphere, or to render unwholesome the water used for the support of human life.

All these points, which do not appear to have been fully com-

prehended in the Sewage Acts, are examined at length, and suggestions are offered for their regulation, with examples of the effects resulting from their neglect.

The advantage of placing the water-courses of the country generally under a well-regulated system of management, is insisted upon as the most effectual mode of guarding against the destruction of property, and not unfrequently of human life, which ensues from the effects of sudden inundations, such as have recently occurred in the county of Middlesex.

Original Communication.

ON THE ENGINEERING OF THE ANCIENT EGYPTIANS.

BY J. S. PERRING, ESQ.

MANY YEARS A RESIDENT IN EGYPT.

No. IV.

We now propose to consider the most interesting monuments of antiquity, and which alone of the celebrated seven wonders have remained. The Pyramids,—mysterious records of man's early power; enduring for countless ages; undestroyed and indestructible by time; speaking of mighty generations long since passed away, and of their monarchs, the memory of whose very existence, save for the testimony of these unrivalled edifices, would have been lost in the obscurity of the infancy of time.

All the ancient authors (with the single exception of Homer) speak of the Pyramids, and vaunt their magnitude and antiquity; but their accounts furnish us with but scanty and doubtful information, for the erection of these eternal monuments belongs to an era too remote for history to record.

Until lately, the very object for which they were erected was involved in doubt; and the engineer alike searched ancient record, and looked at modern observation, without obtaining any

real information. Innumerable theories on their design and character have been formed, without any data that could be depended upon, and of consequent learned and useless discussion there has been a sufficiency.

The last five years have, however, furnished an ample stock of valuable information; and the indefatigable researches and brilliant discoveries of Colonel Howard Vyse, enable us to reason with some certainty on these wondrous structures. These discoveries are of the highest interest, and guided by them we proceed to examine some of the evidences of design shewn in the erection of these vast edifices, and to prove the constructive ability of the builders.

It is no part of our present object to enquire, whether the pyramidal form itself may or may not have been sacred, and owes its origin to its resemblance either to an ascending flame or descending rays of the sun; but, as the practice of raising a mound of earth over their illustrious dead, seems to have been universal amongst early nations, we may perhaps more safely ascribe the erection of Pyramids to a desire to form a more permanent memento of hewn stone.

And no better shape could have been adopted for eternal duration; it resists all external causes of decay, and contains no elements of destruction within itself. All oblique pressure is avoided, and the simple weight of the superstructure equally distributed over the whole area of base.

The proportions of these monuments have been supposed to have reference to the peculiar tenets of the Egyptians, in connection with certain celestial bodies; but if so, all erected near the same place, and about the same period, should have the same proportions. The Pyramids of Gizeh, we are assured by all ancient authors, confirmed by modern research, were erected within a short period of each other; yet Sir John Herschel gives his opinion, that the angles of the passages "differ too much and too irregularly to admit of any such conclusion;" nor was the exterior angle of these buildings "connected with any astronomical fact, and probably adopted for architectural reasons."*

The only point on which there is a perfect correspondence in all the Pyramids of Egypt, (except one,) is in their position with regard to the cardinal points, opposite to which their faces are placed; and the exact manner in which this is done, speaks much for the correct observation and true astronomical knowledge of the Egyptians.

If then the shape or proportions of these monuments have not been dictated by astronomical relations, to what are we to ascribe it? Sir John Herschel, a very competent authority, considers

* Vide Col. Vyse's "Operations," Vol. II., p. 108.

they have not, but that the shape was probably dictated by "architectural reasons;" that is, either from a wish to obtain the most solid and enduring shape, or from certain notions of symmetry.

Their present state shows that durability was effected, and that skilfully; for in the great Pyramid of Giseh, nearly 480 feet in perpendicular height of solid masonry, the pressure of the enormous mass is so distributed, that the lower courses have only to sustain about 25,000 lbs. per square foot, whilst the material of which the building is erected is equal to at least 1,110,000 lbs.

The proportion that seems to have regulated the exact form of the great Pyramid of Gizeh, and of several others in Egypt, seems to have been a ratio of height to side of base, as 5 : 8, and this gives the following proportions on a direct section:—As half the base : perpendicular height : : the apothême or slant height : the whole base. Or, for each side, it may be thus stated:—As Rad. : Tang. : : Sec. : 2 Rad."*

From finding, in every case, that the angles are thus regulated, we come to the conclusion, that the Egyptians, at the time of the erection of these mighty monuments, possessed no knowledge of a division of the circle *per se*, but that their angles were regulated by the proportion of base to perpendicular height; in fact, the tangential measure of the angle, but not its abstract admeasurement. That they learned to divide the circle into degrees at a later period, is highly probable, as they were celebrated for their astronomical knowledge.

Our space does not here allow us to pursue this subject further; nor is it within the scope of these papers to furnish a description of the Pyramids† themselves; yet we cannot avoid endeavouring to convey some slight notion of the magnitude of the great Pyramid of Gizeh.

The space originally covered by it, appears to have been 8 Egyptian jugera or acres, equal to rather more than 13½ English acres. The total contents of solid masonry 89,418,806 cubic feet, weighing 6,878,369 tons; but, as these quantities are difficult to be apprehended, we will endeavour to give some data, whereby a comparison with known objects may be established.

New London Bridge is perhaps the largest and most magnifi-

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* Mr. Agnew is of opinion, that "the Egyptians sought, in the appropriate figure of the Pyramid, to perpetuate, at the same time, a portion of their geometrical science;" and that in the third Pyramid of Gizeh, the "perpendicular height was the radius of a circle, the circumference of which was equal to the square of the base;" in fact, that the Egyptians, 4000 years ago, had practically solved the celebrated problem of the quadrature of the circle!

† For this, vide Plans, &c., of the Pyramids, lately published by Frazer and Weale.

cent single work of the present age; but there is sufficient stone in the great Pyramid to erect 57 edifices of the same magnitude.

A railway, laid on blocks, requires 14,000 cubit feet per mile, consequently there is sufficient stone in this building to lay a substantial railway 6387 miles, or round more than a fourth of the circumference of this globe at the equator, or a double line from hence to the Pyramid itself.

In collieries, a 12-horse steam-engine is considered necessary to draw 100 tons of coals per day from a 30 fathom shaft, therefore it would require the active services of 9 engines of 10-horse power each, for 20 years, to lift the materials from the plain, at the foot of the hill on which the Pyramid stands, to the level of the height required; but this only gives the power for lifting each stone to the level of the bed it was to occupy, and does not comprehend the extra power required to convey it to its exact situation.

About two-thirds of the stones, composing the Pyramid, were drawn from the vicinity, the average distance being about half a mile; a considerable portion of the remainder were brought from the quarries at Tomah, a distance of 11 miles; and a small quantity of granite, for the construction of the principal apartment and portcullis, from Essouan.

Supposing a good level turnpike-road had been formed from these quarries to the Pyramid, and well-constructed wheel-carriages used thereon, the services of 450 horses would have been required for 20 years to draw the materials. Or still further, supposing good modern railways to be laid between the same points, the active services of three powerful locomotive engines, working at 8 miles per hour, would be required for 20 years for the same purpose.

From the quarries of Tomah were drawn the blocks of the greatest consequence; they are situated about 11 miles from the Pyramids, on the opposite or Arabian side of the valley, the distance between them and the Nile being about a mile and a half. The stones were obtained from the quarry by being split off, the size required, by rows of wedges, the thickness of the strata determining the thickness of the blocks; and on re-opening these quarries, by order of the present Pacha of Egypt, in 1837, the author found in them sufficient evidence to shew that the ancient Egyptians fully understood and appreciated a systematic division of labour. The arrangement and unfinished work of the quarry shewed that five different gangs of workmen were simultaneously employed on as many different operations, the one gang preceding the other in the following order:—

At first the rock was cleared of the rubbish and levelled; then, on the surface, thus prepared, another set of workmen marked out, by a cut, a couple of inches deep, the stones re-

quired, and so arranged as to avoid fissures or bad stones. After this the holes for the wedges were cut, leaving between each wedge a space of five or six inches. Another set then inserted the wedges and split off the stones, leaving the stones thus split to be removed at convenience.

A piece of sculpture in one of the quarries, informs us, that the stones were conveyed to the river side on sledges, drawn by oxen, and for that purpose a fine broad road, of uniform inclination, was formed between the quarries and the river. The descent of this road, was about 1 in 50, in the direction of the traffic, being about the right inclination for the mode of transport. The conveyance was from thence in boats, which passing through canals, immediately opposite, entered the old course of the river, (spoken of in our 2nd paper,) which ran near the hills on which the Pyramids are placed. The causeway, spoken of by Herodotus, Lib. II. c. 124, was formed for the conveyance of these stones to the great Pyramids; and, as all the Pyramids of Egypt are on elevated situations, similar inclined planes were formed for the conveyance of materials to the buildings, and they seem afterwards to have been adorned, as says Herodotus, with "figures of animals," and made the regular approach to the edifices.

Herodotus thus describes the causeway leading to the great Pyramid.—"This causeway is five stadia in length, forty cubits wide, and its extreme height 32 cubits; the whole is of polished marble, adorned with figures of animals," and he says that ten years were exhausted in forming it.

The inclination of this causeway, (which is formed of immense blocks of stone,) was about 1 in 36, and at the upper end of it the rock was scarped away to near the base of the Pyramid, at the same inclination. As this causeway was formed of hewn stone, the greater inclination of it, as compared to the road from the quarry, was compensated by the friction being less on its smooth surface.

In preparing the base of the edifice, great care was taken to ensure stability by levelling the rock to a perfectly horizontal bed, and where advantage was taken of it to form part of the Pyramid, it was stepped up in flat beds, according to the thickness of the layers of stone used in the building.

The same care is observable in the whole of the structures, the beds of the masonry being always horizontal, except in one instance, where the outer stones forming the revetement, have been placed nearly at right angles with the inclination of the exterior face; and it is remarkable, that this is the only Pyramid where there has been any considerable settlement or disruption of the edifice.

Two, however, of the Pyramids are not founded on rock; but

a space, somewhat larger than the base, having been enclosed within retaining walls, has been filled with fine sand; and the perfect practical knowledge of the Egyptians is shewn in that they still remain securely placed, and not a stone of the one, or brick of the other, has moved from its place.

In our last, we incidentally mentioned the various methods used in the Pyramids to cover a space:—where inclined blocks, meeting in the centre, were used, care and skill are shewn in the precautions taken to guard against any rupture arising from the oblique direction of the pressure. The roofs so formed, were composed of three or four tiers, and the lowest tier, forming the ceiling of the apartments, was placed at a rather flatter angle, so that the weight of the superstructure was sustained solely by the upper tier, and the blocks of stone, composing these, being of immense size, distribute the pressure over a large surface, quite clear of the side walls and ceiling of the apartments.

These roof blocks were, in every case, hewn from the compact strata of the Tomah quarries, and the footings and abutments of the same excellent stone; but where extra strength was required, the stronger granite was employed. This is particularly seen in the Pyramids of Abrooseer, where, over the passages leading to the apartments, the footing of the roof blocks is granite.—That it was not more generally used in these edifices, was probably owing to the great distance from which it had to be brought.

But, in several of the Pyramids, the lowest external courses were faced with granite; and experience must have shewn that the salts of the surrounding sands, injured the calcareous stone.

Herodotus, Lib. II. c. 125, informs us:—"The ascent of the Pyramid was regularly graduated by what some call steps, others altars. Having finished the first flight, they elevated the stones to the second, by the aid of machinery, constructed of short pieces of wood; from the second, by a similar engine, they were raised to the third, and so on to the summit." This description does not help us to a very distinct idea of the machine made use of; but as it is known that the pulley was in general use with the Egyptians from a very early period, it appears that the combination of pulleys, with a derrick, formed the portable machine used; and, in confirmation of this, we found, in numerous places in the horizontal layers of masonry, hemispherical holes, about 8 inches diameter, in the stones, that, from the polish of the internal surface, had evidently formed a step or footing for the derrick. A machine of this nature for lifting weights, is described by Vitruvius, and called a "Polyspaston."*

The workmanship of the external casing, and the passages and

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* Vide Vitruvius, Lib. I., c. 5.

apartments, is beautiful in the extreme. The beds and sides of the casing stones were worked to a perfect surface; but the face or front was left roughly hewn to nearly its shape, and a little projecting to save the edges from being injured by taking up the stones for the courses above. When the Pyramid was thus complete, the work of levelling commenced from the apex, working downward. One set of workmen trimmed down the projecting parts and brought the whole to a level, but somewhat rough surface, which was afterwards planed smooth by others; and the putlock holes of the scaffolding, used by these workmen, filled up with small pieces of stones, accurately fitting in front, and cemented in with gypsum.

For precision of workmanship, these casings are unrivalled; stones of uncommon magnitude, fitting to each other, and having a fair and even joint throughout their whole surface from 30 to 50 superficial feet. Generally the thickness of mortar intervening, is not more than that of a sheet of tissue paper; and externally, the joint is seldom visible. The difficulty of obtaining surfaces like these, will be appreciated by every practical man, and serve to shew the great and unequalled accuracy of their workmen; and this was probably the result of the division into castes, whereby each became thoroughly expert in his department. To obtain such precision, by the ordinary methods now followed, of cutting stone, would be impossible; but they seem to have effected it by the aid of a surface plate, marking with it the projecting inequalities, and then cutting them away, and thus alternately applying the plate and cutting down the projections, until a perfectly flat surface was at last obtained.

To estimate fully the labour involved by this extreme precision, when applied to the Pyramids, we must take into consideration the magnitude of these edifices.

Diodorus Sicules, Lib. 1, c. 63, thus concludes his account of the Pyramids:—"These works are acknowledged to far exceed the rest in Egypt, not only in their imposing mass, and in the expense of their construction, but in the consummate skill of their workmen; and the architects are more worthy of admiration than the Kings who supplied the expense; for the former effected the execution of the design by their own intellects and zealous exertion; the latter contributed but the wealth they had inherited, and the miseries of their fellow creatures.

List of Patents

Granted by the French Government from the 1st of July to the 30th of September, 1840.

(Continued from page 65, Vol. XIX.)

PATENTS FOR TEN YEARS.

The Count de Beaurepaire, represented in Paris, by M. Perpigna, advocate, of the French and Foreign Patent Office, rue de Choiseul, No. 2, ter: for a new kneading trough.

Draper, of Boston, represented in Paris, by M. Perpigna, advocate, for a machine for making bread.

Frappa and Cecconi, of Paris, represented by M. Perpigna, advocate, for an hydraulic machine.

Régnier, represented in Paris by M. Perpigna, advocate, for a machine for washing, drying, and polishing wax candles.

Robin Gogué, represented in Paris by M. Perpigna, advocate, for an improved pump.

Andries, of Lyons, represented in Paris by M. Perpigna, advocate, for bobbin-net, made on a Jacquard frame.

Barrallon & Forinier, represented in Paris by M. Perpigna, advocate, for a machine for shaving ribbons, &c.

Basset, represented in Paris by M. Perpigna, advocate, for an extract of madder.

Bazin, represented in Paris by M. Perpigna, advocate, for a distilling apparatus.

Beard, of London, for a machine for printing stuffs.

Armengault, of Paris, for the washing of wool.

Beauchet and Rey, of Paris, for the extracting of salts of potash.

Beckwitt Towse, of London, for transferring drawings upon china.

Bedouin Brothers, of Paris, for a mechanical press.

Benoît, of Paris, for new fastenings for windows.

Berton, of Narbonne, for metallic sails for ships and vessels.

Bertrand and Feydeau, of Nantes, for a means of corking stone bottles and jars.

Beranger, of Paris, for improved ink for writing.

Biallon Brothers, of St. Etienne, for combs for weaving.

Blundell, of London, for a new water wheel.

Bonneval, (The Count de) of Paris, for improved cultivation of corn.

Bonvialle Bouveron, of Bordeaux, for the carbonization of river mud.

Boussard and Viel, of Paris, for a portable clock.

Brasis, of Rouen, for new keys for pianos.

Brocchi, of Paris, for an impression of paper for paper-hanging.

Caldesaigues, of Paris, for an improved cut of gloves.

Callou, of Paris, for elastic bands for chair seats.

Calvert, of London, for a band of worsted or horse-hair, called "water elevator."

Camion Pierron, of Vrignes-aux-bois, for improvements in culinary utensils.

Chamblant, of Paris, for improvements in ink bottles.

Chamboridon, Jun., of Bordeaux, for a new kind of jack.

Coste, of Limoux, for a fulling machine.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th August to the* 17*th of September*, 1841, *inclusive.*

To William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in machinery for making pins and pin nails,—being a communication from abroad.—Sealed 31st August.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, Gent., for certain improvements in the manufacture of fabrics, by felting,—being a communication from abroad. — Sealed 7th September.

William Palmer, of Sutton-street, Clerkenwell, in the county of Middlesex, for improvements in the manufacture of candles, and in apparatus for applying light.—Sealed 7th September.

John Rangely, of Camberwell, Gent., for improvements in the construction of railways, and in the means of applying power to propelling carriages and machinery.—Sealed 7th September.

John Lee, of Newcastle-upon-Tyne, manufacturing chemist, for improvements in the manufacture of chlorine.—Sealed 7th September.

List of Patents

Granted for SCOTLAND, subsequent to August 22nd, 1841.

To William Lewis Rham, of Winkfield, in the county of Berks, clerk, for certain improvements in machinery or apparatus for preparing land, and sowing or depositing grain, seeds, and manure.—Sealed 23rd August.

Nathan Waddington, of Hulme, in the county of Lancaster, engineer, for certain improvements in the construction of boilers and boiler furnaces.—Sealed 25th August.

John Cox, of Gorgie Mills, Edinburgh, tanner and glue manufacturer, for improvements in apparatus for assisting or enabling persons to swim or float, and progress in water.—Sealed 25th August.

James Sidebottom, of Waterside, in the parish of Glossop, in the county of Derby, manufacturer, for certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.—Sealed 30th August.

Francis William Gerish, of Earl-road, City-road, in the county of Middlesex, patent hinge maker, for improvements in locks and keys, and in other fastenings for doors, drawers, and other such purposes.—Sealed 2nd September.

Samuel Hardman, of Farnworth, near Bolton, in the county of Lancaster, spindle and fly maker, for certain improvements in machinery or apparatus for roving and slubbing cotton and other fibrous substances.—Sealed 3rd September.

Louis Sachenal, of Tichfield-street, Soho, mechanic, and Antoine

Vieyres, of 40, Pall Mall, watch-maker, both in the county of Middlesex, for improvements in machinery for cutting cork.—Sealed 7th September.

Joshua Taylor Beale, of East Greenwich, in the county of Kent, engineer, and Benjamin Beale, of the same place, engineer, for certain improvements in steam-engines.—Sealed 8th Sept.

Charles Sneath, of Nottingham, lace manufacturer, for certain improvements in machinery for making or manufacturing of stockings or other kinds of loop work.—Sealed 13th September.

Lawrence Kortright, of Oak Hall, East Ham, in the county of Essex, Esq., for certain improvements in treating and preparing the substance, commonly called whalebone, and the fins and such like other parts of whales, and rendering the same fit for various commercial and useful purposes,—being a communication from abroad.—Sealed 14th September.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in machinery for making pins and pin nails,—being a communication from abroad.—Sealed 15th September.

Thomas Craddock, of Broadheath, in the county of Radnor, farmer, for certain improvements in steam-engines and boilers.—Sealed 16th September.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in looms for weaving,—being a communication from a foreigner, residing abroad.—Sealed 17th September.

William Scamp, of No. 11, Charlton-terrace, near Woolwich, in the county of Kent, surveyor, for an application of machinery to steam-vessels, for the removal of sand, mud, soil, and other matters, from the sea, rivers, docks, harbours, and other bodies of water.—Sealed 20th September.

Thomas William Berger, of Upper Homerton, Hackney, in the county of Middlesex, Gent., for improvements in the manufacture of starch.—Sealed 22nd September.

New Patents

SEALED IN ENGLAND.

1841.

To Richard Whitaker, of Cambridge, machinist, for improvements in cutting the edges of books, and paper, for other purposes; and in impressing ornaments, letters, and figures on books, and on other surfaces.—Sealed 4th September—6 months for inrolment.

Theophile Antoine Willhelme, Count of Hompesch, of Mivart's Hotel, Brook-street, Middlesex, for improvements in obtaining oils and other products from bituminous matters, and in purifying or rectifying oils obtained from such matters.—Sealed 4th September—6 months for inrolment.

John Boot, of Quorndon, Leicester, lace-glove manufacturer, and John King, of Henor, lace maker, for certain improvements in machinery or apparatus for manufacturing or producing figured or ornamented fabrics in warp and bobbin net lace machines.—Sealed 4th September—6 months for inrolment.

John Grafton, of Cambridge, civil engineer, for an improved method of manufacturing gas.—Sealed 4th September—2 months for inrolment.

Michael Coupland, of Pond Yard, Southwark, millwright and engineer, for improvements in furnaces.—Sealed 4th September—6 months for inrolment.

George Wildes, of Coleman-street, merchant, for improvements in the manufacture of white lead,—being a communication.—Sealed 4th September—6 months for inrolment.

William Hill Darker, Sen., and William Hill Darker, Jun., both of Lambeth, engineers, and William Wood, of Wilton, carpet manufacturer, for certain improvements in looms for weaving.—Sealed 4th September—6 months for inrolment.

Louis Sachenal, of Tichfield-street, Soho, mechanic, and Antoine Vieyres, of 40, Pall Mall, watch-maker, for improvements in machinery for cutting cork. — Sealed 4th September — 6 months for inrolment.

John Juckes, of Lewisham, Gent., for improvements in furnaces or fire-places.—Sealed 6th September—6 months for inrolment.

Pierre Pelletain, of St. Paul's Church Yard, professor of medicine, for improvements in propelling fluids and vessels.—Sealed 6th September—6 months for inrolment.

Joseph Drew, the younger, of St. Peter's Port, for an improved method of cutting and rolling lozenges; and also of cutting gun wads, wafers, and all other similar substances, by means of a certain machine designed by him, and constructed of divers metals and woods.—Sealed 6th September—6 months for inrolment.

Luke Hebert, of 12, Staples Inn, London, for certain improvements in apparatus and metals used in the manufacture of gas for illumination; also improvements in the apparatus for burning the same,—being a communication.—Sealed 8th September—6 months for inrolment.

Richard Else, of Gray's Inn, Esq., for certain improvements in machinery or apparatus for forcing and raising water and other fluids.—Sealed 8th September—6 months for inrolment.

William Fairbairn, of Millwall, Poplar, engineer, for certain improvements in the construction and arrangement of steam-engines.—Sealed 8th September—6 months for inrolment.

Joseph Cooke Grant, of Stamford, ironmonger and agricultural implement maker, for improvements in horse rakes and hoes. —Sealed 8th September—6 months for inrolment.

Nathaniel Card, of Manchester, candle-wick maker, for certain improvements in the manufacture of wicks for candles, lamps, and other similar purposes; and in the apparatus connected therewith.—Sealed 8th September—6 months for inrolment.

James Thorburn, of Manchester, machinist, for certain improvements in machinery for producing knitted fabrics.—Sealed 8th September—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, civil engineer, for a new or improved method or means of, and apparatus for, cleansing typographical characters or forms of type, after being used in printing,—being a communication.—Sealed 8th September—6 months for inrolment.

Oglethorpe Wakelin Barratt, of Birmingham, metal gilder, for certain improvements in the precipitation or deposition of metals.—Sealed 8th September—6 months for inrolment.

Joseph Garnet, of Haslingden, dyer, and John Mason, of Rochdale, machine maker, for certain improvements in machinery or apparatus employed in the manufacture of yarns and cloth; and are also in possession of certain improvements applicable to the same,—being partly a communication.—Sealed 8th September—6 months for inrolment.

Edward Loos de Schelestadt, engineer and chemist, and Etienne Sterligue, tanner, of Regent's-square, in the county of Middlesex, for certain new or improved machinery or apparatus and process for tanning skins or hides, and preparing or operating upon vegetable and other substances.—Sealed 8th September—6 months for inrolment.

George Mannering, of Dover, plumber, and Henry Harrison, of Ashford, plumber, for certain improvements in the means of raising water and other liquids.—Sealed 8th September—6 months for inrolment.

Alphonse Rene Le Mire de Normandy, of Red-cross-square, Cripplegate, doctor of medicine, for certain improvements in the manufacture of soap.—Sealed 8th September—6 months for inrolment.

William Crosskill, of Beverley, ironfounder and engineer, for improvements in machinery for rolling and crushing land, and in machinery to be used in the culture of grass land.—Sealed 8th September—6 months for inrolment.

William Hickling Burnett, of Ravensbourne Wood Mills, Deptford Creek, for improvements in machinery for cutting wood, and in apparatus connected therewith, part of which may be applied to other purposes.—Sealed 9th September—6 months for inrolment.

Charles Louis Stanislas, Baron Heurteloup, of Albany-street, Regent's Park, for an improved manufacture of continuous priming for, and improved mechanism for the application of the same to, certain descriptions of fire-arms.—Sealed 9th September—6 months for inrolment.

Conrad Frederick Stollmeyer, of Golden-terrace, Barnsbury-road, Islington, merchant, for certain improvements in obtaining and applying motive power, by means of winds and waves, for propelling vessels on water, and driving other machinery,—being a communication.—Sealed 17th September—6 months for inrolment.

George Shillibeer, of Milton-street, Euston-square, carriage-builder, for improvements in the construction of hearses, and mourning and other carriages.—Sealed 20th September—6 months for inrolment.

François Marie Agathe Dez Maurel, of Newington-terrace, Surrey, for an improved buckle,—being a communication.—Sealed 20th September—6 months for inrolment.

William Charlton Forster, of Bartholomew Close, Gent., for a material or compound of material, not hitherto so used, for preventing damp rising in walls, and for freeing walls from damp; which material or compound of material can be applied to other purposes.—Sealed 20th September—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improved machinery for manufacturing felts or felted cloths.—Sealed 20th September—6 months for inrolment.

Joseph Hulme, of Manchester, engineer, for certain improvements in machinery or apparatus for grinding, sharpening, or setting the teeth of cards or other similar apparatus, employed for carding or operating upon cotton, wool, or other fibrous substances.—Sealed 20th September—6 months for inrolment.

Thomas Huckvale, of Over Norton, farmer, for improvements in horse-hoes, and in apparatus for treating and dressing turnips, to preserve them from insects, and promote their growth.—Sealed 20th September—6 months for inrolment.

Alfred Elam, of Huddersfield, surgical instrument maker, for improvements in apparatus or instruments for the relief and cure of *procedencia* and *prolapsus uteri.*—Sealed 20th September—6 months for inrolment.

Luke Hebert, of Birmingham, for improvements in machinery for fulling woollen cloth,—being a communication.—Sealed 20th September—6 months for inrolment.

William Bush, of Deptford, engineer, for improvements in the means of, and in the apparatus for building and working under water.—Sealed 21st September—6 months for inrolment.

Comte Melano de Calcina, of Nassau-street, for improvements in paving or covering roads and other ways or surfaces.—Sealed 21st September—6 months for inrolment.

Edward Emanuel Perkins, of Westow Hill, Norwood, Gent., for improvements in the manufacture of soap.—Sealed 21st September—6 months for inrolment.

John Duncan, of Great George-street, Westminster, Gent., for improvements in machinery for driving piles.—Sealed 21st September—6 months for inrolment.

James Whitelaw, engineer, of Glasgow, and James Stirrat, manufacturer, of Paisley, for improvements in rotary machines, to be worked by water.—Sealed 23rd September—6 months for inrolment.

Henry Bessemer, of Baxter House, St. Pancras, engineer, and Charles Louis Schonberg, of Sidmouth-place, Gray's-inn-lane-road, artist, for improvements in the manufacture of certain glass.—Sealed 23rd September—6 months for inrolment.

George Scott, of Louth, miller, for certain improvements in flour mills.—Sealed 23rd September—6 months for inrolment.

CELESTIAL PHENOMENA FOR OCTOBER, 1841.

D.	H.	M.	
1			Clock after the sun, 10m. 21s.
—			☽ rises 5h. 25m. A.
—			☽ passes mer. M.
—			☽ sets 6h. 59m. M.
—			Occul 101 in Piscium, im. 14h. 9m. em. 15h. 5m.
4	6	52	☿ in conj. with Juno diff. of dec. 7. 58. S.
—			Occul *x* in Tauri im. 13h. 46m. em. 15h. 1m.
5			Clock after the sun 12m. 26s.
—			☽ rises 11h. 8m. A.
—			☽ passes mer. 6h. 20m. M.
—			☽ sets 2h. 39m. A.
6	10	44	☿ in Aphelion
7	9	11	☽ in □ or last quarter.
10			Clock after the sun, 12m. 58s.
—			☽ rises 0h. 35m. M.
—			☽ passes mer. 8h. 10m. M.
—			☽ sets 3h. 26m. A.
	7		☽ in Perigee.
11	17	47	♀ in conj. with the ☽ diff. of dec. 4. 49. N.
12	23	22	Ceres in oppo. to the ☉ intens. of light 0·773
13	6	9	♃'s second satt. will em.
14	4	27	Ecliptic conj. or ● new moon.
15			Clock after the sun, 14m. 10s.
—			☽ rises 7h. 38m. M.
—			☽ passes mer. 0h. 19m. A.
—			☽ sets 4h. 49m. A.
16	0	11	☿ in conj. with the ☽ diff. of dec. 2. 50. N.
—			Mercury R.A. 14h. 18m. dec. 18. 32. S.
—			Venus R. A. 11h. 24m. dec. 5. 15. N.
—			Mars R. A. 17h. 48m. dec. 25. 8. S.
—			Vesta R. A. 2h. 7m. dec. 0. 46. N.
—			Juno R. A. 14h. 1m. dec. 5. 14. S.
—			Pallas R. A. 22h. 14m. dec. 5. 50. S.
—			Ceres R. A. 1h. 32m. dec. 5. 26. S.
—			Jupiter R. A. 17h. 3m. dec. 22. 32. S.

D.	H.	M.	
	—		Saturn R. A. 17h. 51m. dec. 22. 40. S.
	—		Georg. R. A. 23h. 28m. dec. 4. 13. S.
	—		Mercury passes mer. 1h. 8m.
	—		Venus passes mer. 21h. 45m.
	—		Mars passes mer. 4h. 9m.
	—		Jupiter passes mer. 3h. 23m.
	—		Saturn passes mer. 4h. 12m.
	—		Georg. passes mer. 9h. 48m.
17	2	9	♂ in conj. with ♄ diff. of dec. 2. 28. S.
18	11	7	♃ in conj. with the ☽ diff. of dec. 4. 0. N.
19	8	4	♄ in conj. with the ☽ diff. of dec. 3. 48. N.
19	11	7	♂ in conj. with the ☽ diff. of dec. 1. 13. N.
20			Clock after the sun, 15m. 7s.
	—		☽ rises, 1h. 8m. A.
	—		☽ passes mer. 4h. 43m. A.
	—		☽ sets 8h. 24m. A.
21	10		♀ in Perihelion
	15	21	Vesta in oppo. to the sun intens. of light 0·705
22	9	2	☽ in □ or first quarter.
	9		☽ in Apogee.
24	16		Pallas stationary
25			Clock after the sun, 15m. 49s.
	—		☽ rises 2h. 51m. A.
	—		☽ passes mer. 8h. 26m. A.
	—		☽ sets 1h. 4m. M.
25	9	1	☿ greatest Elong. 23. 50. E.
26			Occul λ in Piscium, im 12h. 58m. em. 14h. 4m.
26	9	5	Her. in conj. with the ☽ diff. of dec. 4. 56. S.
	19	4	Juno in conj. with the ☉
	20	26	☿ greatest Hel. Lat. S.
30	5	57	Ecliptic oppo. or ○ full moon.
	—		Occul ε Arietis, im. 10h. 22m. em. 11h. 13m.
31			Occul *d* Pleiadum, im. 5h. 33m. em. 6h. 1m.
	—		Occul *y* Tauri, im. 6h. 14m.
	—		Occul. *f* Pleiadum, im. 6h. 29m. em. 7h. 13m.
	—		Occul *h* Pleiadum, im. 6h. 39m. em. 7h. 7m.

J. LEWTHWAITE, Rotherhithe.

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Recent Patents.

To ETIENNE ROBERT GAUBERT, *of Paris, in the Kingdom of France, Professor of Mathematics, but now residing at the George and Vulture Hotel, in the City of London, for certain improvements in machinery or apparatus for distributing types or other typographical characters into proper receptacles, and placing the same in order for setting-up, after being used in printing.*—[Sealed 13th March, 1840.]

THE object of this invention is to distribute or separate types, numbers, or other typographical characters, and deposit each letter or character, by mechanical means, in its proper place, in a regular manner, side by side, in the box intended for its reception, with its face uppermost, instead of performing this operation by hand, or employing the time of the compositor or distributor for this purpose, when breaking up a form of type after the required number of impressions have been struck off.

In the ordinary process of letter-press printing, after the types and other typographical characters have been set up and used in printing, they are distributed or placed in the proper receptacles intended for each letter or character, before they can be again used by the compositor.

This invention is intended to expedite the operation of "distributing;" and the manner in which this improved mechanism is intended to act, is as follows:—

In the first place,—It is well known, that the different types vary in thickness, according to the letter formed upon them; for instance,—the letter *m* occupies more width of type, or a greater space in a word than the letter *l*; consequently, if the letters of different thicknesses are placed promiscuously in a heap, they may be separated, one from another, by causing them to be moved over, or sifted through different sized holes, pierced in plates or surfaces, or under gauges, like flat arches of bridges,—the narrower or thinner types pass under the different bridges, gauges, or apertures, from one to the other, until they are stopped by their proper bridges, while the thicker will be stopped and made to pass off into a receptacle or channel, intended to receive them. But, as there are upwards of 100 different letters and characters, many of them are necessarily of the same size; and, consequently, several different letters would pass through the same apertures; and, therefore, some other means than the mean difference in the size or width of the type must be resorted to to separate different letters of the same width or guage one from another.

To give the means of effecting this further separation or distribution, and in order that each individual type or letter may be passed into its proper channel or receptacle, notches or indentations are cast or formed in the sides of the types or characters to be used in connection with this invention, which vary in each letter or type in position;

that is to say,—no two types of the same thickness are to have the same or corresponding notches or recesses. The letters are also separate, by making apertures to correspond with the shape of the head of the letter, either in conjunction with or without the different notches.

It will now be understood, that if the apertures are made to correspond with the form of the several types, they will fall or pass through the corresponding holes or apertures, and them only. This will be better illustrated by reference to the diagrams, figs. A, B, and C, in Plate X.—

Suppose *a*, fig. A, to represent a side view of a type, with two notches or grooves at *b*, *b*, formed in its side, then the aperture *c*, through which it is intended to pass, is to be furnished with two corresponding points or projections *d*, *d*, formed on its side.—Suppose fig. B, to represent a side view of a type, of the same size or gauge, but having a different letter or character formed on it, then the type *e*, and its aperture *f*, must have the same notches *b*, *b*, and points or stops *d*, *d*, but placed in a different part of the side of the type, in order that this may be separated, one from the other, when placed in a promiscuous mass.

Now, supposing that the apertures are formed in the bottom plate *g*, of the groove or channel *h*, along which the types are made to pass, either by pushing them by mechanical force, or by causing them to descend by their own gravity down an inclined groove or plate, it will be evident that these different types, although of the same guage, but not being of the same figure, will pass over the aperture of the other one, it being stopped from falling through any hole but its own, by the projecting pins or studs *d*, *d*; which, extending across part of the hole, support the type, and prevent it falling through, at the same time serving as a guide or assistant in its passage across or over this aperture, until it meets with its own or corresponding hole,

when it will fall through and pass off by a channel into the receptacle intended to receive it.

Figs. C, and D, shew further variations of the change which may be made in the position of the grooves and points in the types and apertures.

The types to be sorted, are placed promiscuously in a heap, on an inclined plane, down which they slide, or are shaken into the apparatus. They are fed or conducted into the interior of the machine by grooves or channels, which are placed in an inclined position, to assist their forward motion. An apparatus, attached or connected to these grooves, prevents more than one type at a time from passing into the sorting or separating part of the machine.

This apparatus consists of stops or bolts, which are alternately raised or depressed by any suitable mechanism; these stops rise up about the thickness of one type, and impede the progress of the types, in the following manner:—If one type should advance on the top of another, the lower one would be retained, and the upper allowed to slide over the stop, and enter the channel conducting to the apparatus. From these grooves the types and spaces descend on to plates, furnished with a number of oblong slits or passages, which are long enough to allow the spaces or blanks to pass through and fall down on to a plate which conveys them away, as will be hereafter described, but are not sufficiently long to admit of a letter, or other typographical character, passing through. The spaces are by this means separated from the letters and disposed of; and it remains now to distribute the letters and convey them to their proper receptacles.

This distribution is effected in two or three different ways, which will be better understood by reference to the drawings. Fig. 1, is a plan view of the whole machine; A, is the inclined plane, upon which the types are promiscuously

placed. This plane has a slightly oscillating or shaking motion, communicated to it by any suitable mechanical contrivance; the plane A, being sufficiently inclined to allow the types to descend slowly when it receives this motion. From the plane A, the types pass on to a plane B, (called the directing plane,) from whence they are conducted by the oblique bars *a*, into the passages C, called the directing passages. The types follow in a row, down the directing passages, the sides whereof (on part of their length) are raised only sufficiently to allow of one type passing down at a time; and, consequently, if one letter is on the top of another, the upper one will be shaken off, and fall down into a receptacle placed below, from whence they are removed back on to the plane A.

The passages are closed at their lower ends by the moveable bolts or stops *c*, *d*, which are raised and lowered by the backward and forward motion of the transverse bars *e*, below. In each passage, one of the stops or bolts is raised when the other is lowered.

Fig. 2, is an end, and fig. 3, a side view of this part of the apparatus, shewn detached It will be seen, on reference to fig. 3, that the upper edges of the transverse bars *e*, *e*, are indented; which, when made to move backwards and forwards, alternately raise and depress the bolts *c*, and *d*, by pressing on their under sides, which are constantly kept in contact with the transverse bars *e*, *e*, by means of springs. This arrangement of alternately raising and lowering the bolts is, as before stated, for the purpose of preventing more than one type from passing down the passage or groove at the same time, or one type on the top of another. Suppose that the bolt or stop *c*, is raised, and the stop *d*, is lowered, the row of types, one on the top of another, as the case may be, will rest or abut against the first stop *c*;

and when the blades *e*, are set in motion, the stop *c*, will be lowered, and allow the types to pass; but simultaneously with lowering the stop *c*, the stop *d*, will be raised, and will therefore arrest the further progress of the type which is undermost, and only allow the upper one to slide over the stop into the lower channel, and from thence into the interior of the machine, to be sorted. The distance between the two stops *c*, and *d*, is less than the length of a type; consequently, when a type abuts against the stop *d*, the tail of the type rests on the top of the stop *c*; and when the position of the stops is again altered, or when the stop *d*, is lowered, this single type escapes down the channel, the others being arrested in the descent by the stop *c*, which rises as the other descends, as before described. The types and spaces descend singly and separately from the channels 1, on to the sifting or separating plate D, which is furnished with openings or apertures, sufficiently long to admit of the spaces passing through them, but not long enough to allow letters or other characters to pass through. It will be seen, that there are ledges at each end of these openings, which would support a letter, and prevent it from falling through. By this means the spaces are separated from the letters and other characters, and conveyed away.

The types may fall on to the plate D, in four different positions; and it is arranged that each type may be tried in all the four positions before it is allowed to escape into compartments to undergo a similar sifting. The positions in which it may be tried, are upon one or other of its faces, and also with the head to the right or left. Each type is made to come over the openings *h*, and *i*, in a regular manner, by means of the transverse bars *f*, *f*, *f*, which prevent it from passing over the opening without being tried. These bars are furnished with openings, alternately, to each

aperture, (see fig. 4); consequently, when one aperture is open for communication with the lower one *i*, the aperture *g*, adjoining the first one, is closed, and so on alternately.

The manner in which the letters are sifted is as follows:— The openings through which the letters are intended to pass, are furnished with small studs, as seen in the detached view, fig. 5; therefore, when the type arrives at the opening, if it is intended to pass through, it will be found that the type has corresponding notches formed on its side; and if the type arrives at the opening, with the notch uppermost, it will not pass through the opening *h*; but when the transverse bar *f*, is shogged on one side, so as to allow it to pass, it will come over the aperture *i*; and as the notch on the type, and the stud or pin in the opening, will be found to correspond, the letter will fall through, and be carried away, as will be hereafter described; but if the notches in the type do not correspond with the stud or stop in the aperture, the type cannot pass through, as it will be supported by the pin or stop, therefore it must be conveyed away to another stage, in order to be sifted or tried a second time, to see whether it belongs to the next class, situated lower down in the machine.

In order to let the type escape, the transverse bar *f*, is shogged on one side, so as to bring an opening opposite to the compartment in which it is placed. The head or tail of the type then meeting with an obstruction from the block *j*, will be turned round, and shot foot foremost down the diagonal ways *k*, which will direct it down through the opening *l*, into the lower compartments.

In passing through the opening *l*, the types fall into diagonal passages *m*, (see figs. 6 and 7.) These passages *m*, are beneath the plate D, and perpendicular to it, and convey the types into the lower compartments of the plate F, situated below the plate D, and parallel to it.

The types which have passed through the openings *h*, and *i*, of the plate D, and have arrived in the compartments *n*, and *o*, of the plate F, below, (see fig, 1,) are brought into the compartments *p*, by means of stops *q*, similar to the stops *j*, which will cause them to turn round and fall against the oblique guides *r*, which direct them into the compartment *p*, but always keeping the foot or end of the type to the right.

Those types which fall properly, so as to register the notch with the stud in the aperture *s*, fall through, but the other continue their progress until stopped by the part *t*; in this position they are raised up by the bolt *u*, which is put in motion by a transverse blade, actuated by any suitable mechanism. Upon being raised up by the bolt *u*, the inclination of the whole machine causes the type to fall over on to its other face, and passing over the obstacle *t*, rest against the projection *x*; and when the projection *x*, is removed, the types will pass down and fall through the aperture *v*.

Those types which have not undergone all the trials, are received at the edge of the plate F, in a box, and removed from thence to the plate A, above; but those that have passed through the openings or apertures *s*, and *v*, are conducted by the passages G, which are inclined from left to right, (see figs. 6 and 7,) on to the plate H, which is situated below, and parallel to the two former ones D, and F. The types arrive here all in the same order; that is to say, with the foot to the right.

On the plate H, the machine divides the types into species. The drawings are made under the supposition that there are 108 different sorts, not including the spaces, quadrats, &c., which were separated at the commencement of the operation.

The types are divided into two principal classes, viz.,

those with a notch in the middle of the foot, and which pass through the apertures *y*, and are conducted by the inclined conduits I, (see figs. 6 and 7,) which are inclined from left to right to the right-hand part of the plate J, below. The second class have no new notch in the foot, and are prevented from passing through the openings *y*, by a small projection, which is formed on the right-hand end of these openings, and which corresponds to the notch formed in the foot of the types of the first class. The second class types must therefore pass over to the openings *x*, through which they fall, and are directed by the inclined conduits K, to the left-hand part of the plate J, below. The types of both classes are simultaneously submitted to the same operations.

Each class is divided into three divisions. The types of the first division have a notch towards the foot of the type, but at the bottom of the letter, and fall through the apertures *a*; those of the second class have a notch at the same distance from the end of the type, but at the upper part of the letter, and fall through the apertures *b*; those of the third class have no new notch, and descend to the lower part *v*, *v*, of the plate J.

The types of the two first divisions, in passing down the conduits L, M, which are inclined diagonally from left to right, arrive upon the little under plates N, and P, pass by the openings *c*, and *d*, and are directed by the conduits or guides Q, and R, (which are inclined from right to left,) to the lower plates S, and T, which, as well as the plates N, and P, are parallel to the upper plates.

The change of direction, caused by the conductors L, Q, M, and R, which are inclined in a contrary direction one to the other, has for its object bringing back the types of the two first divisions into the planes, situated exactly below the plane J. Each division is separated into three

sub-divisions. The types of the first have a notch in the under part of the letter, within a short distance of the head of the type; those of the second have a notch made at the same distance from the top, but on the upper part of the letter; those of the third have no new notch. The types of each sub-division fall through one of the openings *e*, *f*, or *g*. In consequence of this classification, each sub-division consists of only a few different sorts; but which, however, differ in thickness, sufficiently to be able to separate them. Supposing then that each class, division, and sub-division is equal, and there are 108 different sorts of typographical characters, each class will contain fifty-four, each division eighteen, and each sub-division only six.

The types of the same sub-divison are directed by the inclined conductor V, into the little compartments *h*, *h*, which are ranged side by side in steps;—they pass through the openings in these compartments, and fall upon the inclined conductors of the plane X, which brings them all into the common conductor *i*. At the end of this conductor *i*, is an apparatus Y, called the plane, for separating by thickness. This plane is placed perpendicular to the plane X. Upon this plane Y, a number of brass bars *j*, *j*, *j*, are fixed in such a manner that six parallel grooves are formed, being the number of characters that this part of the apparatus is intended to separate. Other transverse bars *k*, extending from the upper ends of the bars *j*, guide the types as they come down from the channel *i*. These bars *k*, form bridges, under which types, of various thicknesses, may pass; that is to say, if a thin character (the letter *l* for instance) comes down the channel *i*, it will pass under all the bars *k*, and find its exit at 1: if, however, a thick letter, such as *m*, comes down, it will not be able to pass under any of the bridges, and will consequently be conveyed out at *b*. When the types have arrived at these

passages, they are completely sifted or separated, and may therefore, by proper channels, be conveyed in their proper boxes, in a case of letter. The spaces, which were separated from the letters at the beginning, are sorted, according to their thicknesses, by a similar apparatus; which, however, must have eight instead of six channels and bridges.

If there should be more than 108 different sorts,—in fact, should there be double or triple the number, the separation may be effected by multiplying the number of classes, divisions, and sub-divisions, and by employing a larger number of notches, situated in different parts of the type.

The annexed drawings shew only four conducting guides, and consequently only four series of corresponding compartments; but, by multiplying the parts, the speed of distribution will be augmented in proportion.

By what means the simultaneous movement of all the transverse bars is effected, to alternately open and shut the bolts in the comparments, is not shewn in the drawings, nor yet the manner of giving the shaking motion to the plane A, where the type is placed in a mixed heap;—these matters, the patentee says, may be arranged according to circumstances; and the machine, when set to work, must be at such an inclination to the horizon as will allow of the types to slide down without assistance, when not prevented from so doing by any parts of the apparatus which may be placed there for that purpose. The proper inclination of the machine is shewn on the drawings, by the dotted line, fig. 6, which represents the horizontal line when the machine is properly mounted for work.—[*Inrolled at the Petty Bag Office, September*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To William Jefferies, *of Holme-street, Mile End, in the county of Middlesex, metal refiner, for improvements in obtaining copper, spelter, and other metals, from ores.*—[Sealed 1st July, 1840.]

This invention relates, first, to a mode of obtaining copper from copper ore; and secondly, to a method of obtaining zinc from zinc ores.

The patentee says, his improvements are confined to the smelting process, and prefers the ores to be in a raw state, instead of calcining or roasting previous to smelting; the ores may, however, be roasted or calcined previous to smelting. If this invention is to be applied to a smelting furnace, working according to the old plan, the furnace is charged with raw or calcined ore; and when it has been well skimmed, a quantity of carbon or alkali, ground to a fine powder, is stirred into the melted mass; the powder being added until the mass in the furnace becomes dry and friable, in which state it is pushed forward to the bridge, and the heat continued until the mass is well melted; the furnace is then tapped, and the metal run off into water, leaving the slag in the furnace; then charge the furnace again, and treat the charge with carbon or alkali, as above described. It is not necessary, however, to tap or draw off the metal after each charge, as two or three charges may be added, and treated with alkali or carbon, previous to tapping. The carbon preferred by the patentee, is anthracite coal or charcoal; and when alkali is used he prefers common soda, but does not confine himself to it alone.

The metal obtained by this process, must subsequently be treated in the same manner as metal obtained in the ordinary way; and, as this after process is well known, it will not be necessary to give any further description.

The second part of the invention relates to a method of

smelting fine ores, and consists in carrying on the smelting process in large ovens, heated externally; by which means a large quantity of ore may be operated upon at once, at a very reduced cost, and zinc produced of most excellent quality. The description of oven and furnace employed by the patentee, is shewn in Plate X., at fig. 1, which represents a transverse section of an apparatus, suitable for treating three or four tons of ore at the same time, instead of having a number of small vessels or retorts in a furnace. From the upper as well as the lower parts of such oven, several small pipes *a, a*, descend into vessels *b, b*, containing water; and, as distillation proceeds, the metallic zinc will (as it becomes evaporated) pass down the pipes *a, a*, and be cooled. In constructing an oven for this purpose, the bottom and roof should be as thin as possible, so as to allow the heat to pass freely through the fire-brick, and at the same time the bottom must be strong enough to support the charge of ore. The fire-bricks, of which the oven is composed, are therefore of a peculiar form, as shewn at fig. 2; and, by this means, the bottom of the oven may be made of three-inch bricks, and the arch or top, of two-inch bricks.

In working, according to the improved mode, we will suppose that the oven has been at work, and is ready for a new charge;—the ore is taken and mixed with about five per cent. of small bituminous coal; the oven is then charged as full as possible, and the mouth closed and luted with fire-clay; continue the fire, and distillation will proceed, as when small vessels or retorts are used, the metal passing down the pipes into the receivers as it is distilled. As there are several pipes to conduct off the distilled metal, care should be taken that none of these pipes are left open to admit atmospheric air. When the charge has been worked off, the oven is opened, and the refuse or slag drawn out, and a fresh charge immediately supplied.

In conclusion, the patentee says,—that although he has been particular in describing the exact means he pursues, yet he does not mean to confine himself thereto, so long as the general character of the different parts of the invention are retained. And he claims, as the first part of the invention, "the mode of smelting copper ores, by treating the melted metal with carbon or alkali, as above described; and secondly, the mode of obtaining zinc from ores, by means of ovens, as above described."—[*Inrolled in the Inrolment Office, January,* 1841.]

To JEAN PIERRE ISIDORE VERDURE, *of the Sabloniere Hotel, Leicester-square, in the county of Middlesex, Gent., for improvements in the manufacture of starch, and in machinery for preparing and in employing of the refuse matters obtained in such manufacture.*—[Sealed 25th January, 1839.]

ACCORDING to the ordinary process of making starch, the wheat, being ground, is submitted to a process of steeping for a considerable length of time, and fermentation takes place; by which means the gluten is injuriously acted upon, and becomes a putrid and refuse material, and is of little value; the general use to which it is applied being to feed pigs.

Now, the object of this invention, is to obtain the gluten in a pure state, separate from the material for making starch, in order that such gluten may be more advantageously employed, in place of submitting the gluten, together with the other materials, to the usual steeping and fermenting process, by which the gluten becomes putrid.

The invention also relates to machinery, whereby the products for making starch are separated from the gluten, leaving the gluten in a prepared state, and suitable for being employed in the making of bread, biscuits, and other preparations, wherein it is employed. The new process and machinery, whereby wheaten flour is converted into starch, is as follows:—

The wheat is to be ground and sifted, in order to separate the bran, and dough is to be made of the flour, either by hand or by machinery. To use a machine, capable of mixing large quantities at a time is preferable. The dough being prepared, is next submitted to pressure and movement by a machine, called a kneading trough; by such means, the dough is turned and opened out, offering fresh surfaces, to be washed by means of streams of water, whereby the materials, for starch-making, are separated from the gluten, and carried away by the water, leaving the gluten in a sweet and pure state, which may be immediately mixed with flour or other materials, and made into bread, biscuit, maccaroni, and other preparations, containing gluten.

The machine employed for kneading the dough, consists of a long semi-circular trough, divided into compartments by means of wooden partitions. A series of rollers, mounted on one common shaft, work in these compartments, and knead and press the dough, by forcing it through passages made in the partitions. Water, for the purpose of washing the dough, is supplied to the trough; the sides of which are furnished with sieves, through which the water may escape into gutters.

The dough being supplied to the machine, is rolled and pressed in such a manner, that fresh surfaces are continually being exposed to streams of fresh water, which proceed from a perforated pipe; and the process of kneading the dough, together with the wash, is to be carried on

so long as the water, running into the gutters, appears white and clouded, by the materials for starch-making. As soon as the water appears clear, the starch materials will be separated from the gluten.

The water, with the material for starch-making, is received into any suitable vat or vessel, in which it is allowed to remain from sixteen to twenty-four hours, till the material for starch-making, is fully precipitated, when the water is to be drawn off by a syphon, or other convenient means; and the water thus obtained, may be employed for the manufacture of vinegar.

The precipitate is to be put into vats or tubs, together with some sour waters from a previous fermentation, in the proportion of one part, by measure, of sour water to nine parts, by measure, of the material for starch-making; and the same are to be permitted to ferment during from five to eight days, taking care, occasionally, to stir the same. The completion of the process of fermentation being readily ascertained by forcing a stick down into the materials under process; and if the water, on withdrawing the stick, flows clear and uncoloured, the process is complete, and the sour water is to be removed by a horse-hair sieve, or other suitable means. And it should be stated, that if bran has been put into the precipitate, (or material for starch-making,) to undergo the process of fermentation,— in such case, the fermented product of the starch is to be washed, in order to separate the bran therefrom, as is well understood by starch-makers; but, in case the bran is not thought to contain so much starch as would justify the after trouble of washing, then, the bran being omitted, the washing of the fermented product will not be necessary. The product thus obtained, is then to be treated in like manner to the washed fermented product of starch, as heretofore practised, when starch is made by steeping and fer-

menting the whole product of the wheat, and thereby destroy the value of the gluten, which is an important product of the wheat, when treated according to this invention. In carrying on the process of fermentation, the materials are kept to a heat of from eighty to ninety degrees of Fahrenheit.

The principal object of this process and machinery, is so to operate, that the gluten may be obtained, separate and pure, (to be employed for various purposes,) from the product for starch-making; and it is stated, that by having simply to act on the separate materials for starch-making, not only is much time saved by the combined washing and kneading process, but also a larger product of starch is obtained, by the mode of first separating the materials for starch-making from the gluten, as the ordinary process of separating the refuse materials in starch-making, subsequent to fermentation, takes away much of the starch in the employment of a given quantity of wheat in the making of starch.

When using the gluten, prepared in the process of separation, by kneading and washing, to the purpose of making bread, biscuit, or other preparation, containing gluten from wheat, the same is to be mixed with wheaten or other flour or material, in any proportions, persons employing the same, may think desirable, for the particular object to be obtained.

The patentee, in conclusion, states, I have found that, in making bread, the mixing of one part of gluten with four parts of wheaten flour, makes very excellent bread; and very good bread, by mixing potatoe flour with gluten; and I have found, that a mixture of thirty-two pounds of fresh gluten, thirty-six pounds of potatoe flour, (fecula,) and twenty pounds of yellow potatoes, of good quality, cooked by steam, makes good bread; and in

making biscuits, the mixture of one-third of gluten with one-third of wheaten flour and one-third of fecula, makes very excellent biscuits; and mixing fresh gluten with wheaten flour, till the paste is of the required condition, makes very fine maccaroni; and it should be stated, that when the mixture of the flour with the gluten is being performed, the same are kept warm by steam-heat or otherwise, to about from eighty to ninety degrees of Fahrenheit.

And it may be desirable to remark, that by pursuing the mode of making starch, as above described, the nuisance heretofore consequent on the putridity which is caused by the fermentation of the gluten contained in the wheat, as well as the other products thereof, is, by means of the new process, got rid of, and the manufacture of starch may be carried on without nuisance.—[*Inrolled in the Inrolment Office, July*, 1839.]

To William Miller, *of Clitheroe, in the county of Lancaster, engineer, for certain improvements in grates, used in steam-engine or other furnaces or fire-places.* —[Sealed 1st August, 1839.]

These improvements in grates, used in steam-engine or other furnaces or fire-places, consist in the peculiar manner of construction and in the method of mounting or supporting the fire-bars composing the same, in order that the fire-bars may be simultaneously slidden in parallel horizontal directions, without disturbing their vertical position; the principal feature of novelty and improvement, being the movement of each alternate fire-bar in one direction, whilst the intermediate bars are moved in the opposite direction; this sliding motion, together with the indented

or uneven surface of the fire-bars, is intended to prevent the formation of clinkers in the furnace,—thus, to preserve the perfect freedom of the air passage between the fire-bars, and increasing the combustion and heating power of the fuel.

In Plate XI., fig. 1, represents a plan or horizontal view of a fire-grate for a steam-engine furnace; the top, as well as other unnecessary adjacent parts, being removed. Fig. 2, is a transverse section, taken vertically at the line A. B. in fig. 1; and fig. 3, is a longitudinal section, taken vertically at the line C, D, in fig. 1. The front or firing end of this grate is at *a*, and the back at *b*, *c*, *c*, being two side plates, upon which are cast the angular upright supports *d*, *d*, *d*, *d*, upon which the intermediate oscillating bars *e*, *e*, *e*, *e*, are mounted. These bars (one of which is seen in side elevation detached at fig. 4,) are furnished with V-edged uprights *f*, *f*, for the purpose of carrying the fire-bars *g*, *g*, *g*, *g*, which have also corresponding recesses or notches formed upon the under side of each extremity; and, it will be perceived, that each support *f*, in one bar *e*, is placed opposite the space between such supports in the adjacent bar *e*, and so on at the opposite end of the grate; in order that the oscillating bars $e,^1$ $e,^1$ may support each alternate fire-bar, and that the other oscillating bars $l,^2$ $l,^2$ may carry the intermediate fire-bars. The horizontal sliding motion of the fire-bars is effected by the reciprocating action of the working bar *h*, *h*, moving to and fro upon its central bearings *i*, *i*. It will be seen in fig. 2, that this working bar *h*, is provided with upright arms *k*, *k*, *k*, *k*, for the purpose of taking into corresponding notches *l*, formed in the under side of every alternate fire-bar; and that each intermediate fire-bar is also provided with an extension or leg *m*, upon its under side, for the purpose of taking hold of the working bar at

the spaces *n*, between the uprights *k*; thus it will be very readily perceived, that if any adequate power were communicated to the working bar *h*, *h*, by means of the lever *o*, connected with any first mover, the fire-bars would be simultaneously caused to slide longitudinally side by side and in parallel planes, but in reverse directions, alternately.

Fig. 5, represents a side view of one of the fire-bars detached, the indented surface being for the purpose of assisting the bars in preventing the formation of clinker, and the openings or mortices *p*, *p*, being cast in them as extra air passages.

The patentee claims the moving or sliding fire-bars of grates or furnaces in parallel horizontal directions, without disturbing their vertical positions; each alternate bar or bars moving in one direction, whilst the intermediate bar or bars move in the opposite direction; and used in combination with the uneven surface of the fire-bars, for the purposes and in the manner above described.—[*Inrolled at the Rolls Chapel Office, February*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To HUGH UNSWORTH, *of Blackrod, in the county of Lancaster, bleacher, for certain improvements in machinery or apparatus for mangling, drying, damping, and finishing woven goods or fabrics.*—[Sealed 27th August, 1840.]

THESE improvements in machinery or apparatus for mangling, drying, damping, and finishing woven goods or fabrics, consist, firstly, in a certain combination or arrangement of mechanism, whereby all such processes employed in bleaching goods, may be performed in one machine, instead of being separately effected by distinct machines or

processes, as hitherto done, and thus producing a better "finish or condition" upon the calicoes or other fabrics, and also greatly economizing hand labour. Secondly, in passing the cloth after it has been once dried, again partially through the mangling or calendering portion of the apparatus, and in contact with the wet cloth, in order that the dry cloth may thus be damped or "conditioned," which necessary process in finishing woven goods or fabrics, is usually performed separately by a damping machine. And, lastly, in the application of a drying cylinder to the ordinary mangling or calendering apparatus, thereby rendering that machine much more effective in its operation upon the cloth, in those instances where the improved combination of machinery is employed in mangling only, and not for the finishing process.

In Plate XII., fig. 1, represents a side elevation of the improved apparatus, as adapted to operate upon calicoes, &c., subsequent to the process of bleaching; and fig. 2, represents a similar view in section, taken vertically through the middle of the machine.

The main framing or standard of the machine *a*, *a*, *b*, *b*, support or carry ordinary mangling or calendering bowls or rollers *c*, *c*, *c*, *c*, (composed as usual, some of brass or metal, and others of paper or cotton, as required,) bearing in steps or pedestals *d*, *d*, *d*, *d*, and also a large drying cylinder *e*, *e*, heated by steam through its axis, supplied by the pipe *f*, or otherwise; other auxiliary drying cylinders *g*, *g*, are also provided and suitably furnished with tension or guide rollers *h*, *h*, when the drying surface of the cylinder *e*, is not found sufficient, as in the mangling process only. The machine is also provided with heavy weighted leverage *i*, *i*, and connecting links *k*, *k*, for the purpose of increasing the pressure of the mangling cylinder *c*, *c*, and dispelling the greater portion of wetness in the

first instance, as the cloth enters the machine, passing over the stretching or distending bars *l, l, l*. There is also the ordinary similarly weighted leverage *m, m,* applied to the upper calendering rollers *c, c,* and also the usual lifting bar *n, n,* with its rack and pinion *o, o,* to be worked by a winch handle, for raising the two upper rollers *c, c,* when necessary, by means of links or rods *p, p*.

The operation of the machine is as follows:—the wet cloth, as it comes from the squeezers after bleaching, or any other wet process, is placed upon a scray or table, and first guided by the hands of the attendant over and under the stretching rails *l, l, l,* and passed between the two lower mangling rollers *c, c,* where great pressure being applied, as before stated, it is ready to proceed immediately around the drying cylinder *e, e,* when it may be only partially dried, and passing onwards (in the direction of the arrow,) is submitted to the upper calendering cylinders *c, c,* and over the other drying cylinders *g, g, g, g,* as shewn in the drawing, when the dried cloth is again passed into the machine at the back, proceeding from the surface of the lowest drying cylinder, and thence through the calendering bowls *c, c,* a second time, but now in contact with the wet, or only partially dried cloth; thus receiving the operation of damping by such contact, instead of being separately damped by another machine, as heretofore done; this damping and finishing operation, being thus much better performed, and the "condition" and "finish" of the cloth materially improved. After this operation, it is wound upon a roll at *q*, by a strap *r*, passing around the pullies *s, s,* or in any other convenient manner. If thought desirable, an ordinary stretching cylinder may be employed in this machinery, as shewn by dots in fig. 2, in place of the rails *l, l*.
—[*Inrolled at the Rolls Chapel Office, February,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To William Newton, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, patent agent, for an improved apparatus and process for producing sculptured forms, figures, or devices, in marble and other hard substances,—being a communication.*— [Sealed 5th May, 1840.]

This improved apparatus and process, for producing sculptured forms, figures, or devices, in marble and other hard substances, consists, first, in the adaptation of a mould, die, or matrice, of metal or some other hard material, in which the counter-form of the figure or device, intended to be sculptured, has been made, and its application to the surface of the stone or other hard substance to be wrought. Secondly, in the means by which the operation of sculpturing is effected, viz., by the repetition of slight but rapid blows of the mould or die, struck against the face of the stone or other hard substance, by which the surface of the stone becomes abraded, and particles gradually broken off, leaving the face of the stone ultimately in a form, corresponding to the mould or die, which has been working upon it.

If a copy of a medallion or mask is required to be sculptured in bas-relief, by this apparatus,—in the first place, a matrice or die of the design should be produced, by casting from the original in metal, (say iron, case-hardened,) or in some other hard material; and when so produced, mounted in a convenient mechanical apparatus, capable of raising and depressing it, in order to strike the face of the mould or die, by a succession of rapid but very slight blows against the face of the block of stone or other material about to be wrought.

In Plate X., fig. 1, is a side elevation of a machine,

suited to the performance of this process; fig. 2, is an elevation of the back part of the same; and fig. 3, is a detached horizontal representation of the striking lever, which carries the mould. A portion of this striking lever and mould is shewn in section, and upon an enlarged scale, at fig. 4, with the block of stone under operation.

The block of stone to be worked upon, is represented at A, A, supported upon very firm stationary bearings B, B. The matrice or hollow mould C, formed to the counter-figure of the mask intended to be wrought, is securely attached to the lever D, which is a strong frame of iron, mounted in the machine on pivots E, E. These pivots are made adjustable, in order to regulate the proper height of the frame from the block of stone. To the outer end of the lever or frame D, a staple F, is attached, which is also made adjustable by a nut and screw. A cord G, attached to this staple F, is also connected at H, to the end of a series of cranks and rods I, I, I, and J, mounted in a horn-shaped frame K, K. The crank J, at the lower end of this series, is acted upon by stops, notches, or teeth, in the periphery of a ratchet or tappet-wheel L; and this wheel is made to revolve by a pulley M, upon its axis, driven by a band N, from any first mover.

It will now be seen, that if rotary motion be given to the tappet-wheel L, the steps, notches, or teeth of that wheel, as it revolves, will act against the arm of the lower crank J, and produce a slight reciprocating motion in the series of cranks and rods I, I, I, and J; which motion, being communicated through the cord G, to the lever D, holding the mould or die C, will cause the mould or die, by a rapid succession of slight blows, to beat upon the surface of the block of stone A; and in a short time, to abrade the stone in all those parts where the surface of the mould or die strikes against it.

This abrading process will be facilitated by the introduction of sand, emery, diamond dust, or other hard gritty powder, with water, between the surfaces of the mould or die C, and the stone A, under operation; which may be done by making several small apertures through the mould or die, as shewn at *a*, *a*, in the section, fig. 4, in the most eligible parts for distributing the grit equally; and the sand may be conducted from a hopper O, down an inclined plane or gutter P, and the water introduced, in very small quantities, from a flexible pipe Q, or in any other convenient way. In this manner, a rapid succession of very slight blows, on the surface of the stone, or other matter to be sculptured, will cause the prominent parts of the mould or die to abrade or wear away the superfluous parts of the stone, thereby reducing it, and causing it gradually to assume the form, or rather the impression or counterpart of the mould or die; the hollow parts of the mould or die forming the relief of the stone.

Towards the end of the work, a finer powder should be used than at the beginning, in order that the work may leave the mould or die in a more highly finished state. This process may be adapted to every kind of sculpturing or engraving on stone, by employing several small moulds or dies (each forming a portion of the subject) when any complicated works, such as busts or statues, are intended to be produced.

By means of different combinations of moveable letters, types, or tools, to be used as a mould or die, in the way described, any inscription may readily be produced; and the patentee states, such is the delicacy with which the striking mould or die acts, that the finest incisions may be made, even in those crumbling kinds of stone, which would not support the action of the common chisel.

The apparatus may be adapted to operate on vertical

surfaces, as the fronts of walls or buildings; and even on inverted surfaces, such as ceilings, as well as horizontal surfaces.

In extensive works, it would be convenient to place the block to be sculptured, on a sliding base, or moveable carriage, in order to present, with facility, any desired part of the block to the action of the striking mould or die; and which itself might also be made adjustable, if required. Any number of these striking moulds or dies may also be employed at the same time, so as to act simultaneously on an extensive surface, and thus economise time.

The patentee claims the application of the mould or striking die; which, being made by any means, to strike a rapid succession of light blows on the matter to be sculptured, shall abrade or wear away the superfluous parts of the surface thereof, and consequently produce a form or figure corresponding to that counterpart of itself.—*Inrolled at the Rolls Chapel Office, September,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To John Hanson, *of Huddersfield, in the county of York, engineer, for his invention of certain improvements in metres, for measuring volumes of gas, water, and other fluids, when passed through them; and in the construction of cocks or valves, applicable to such purposes.*—[Sealed 22nd August, 1840.]

These improvements in metres, for measuring gas, water, or other fluids, passed through them, consist, in the first place, in an improved construction of metres or apparatus, applicable to this purpose; and particularly, as regards gas metres, in the novel agent employed as a liquid packing or

hydraulic valve, to prevent the gas passing from one chamber or compartment in the metre to another; and as regards cocks or valves used therein, or applicable to such purposes, in an improved construction and arrangement of the slide cock or valve, used for shutting off or turning on the supply and discharge of gas, water, or other fluid, to and from the metre.

The invention is divided under the following heads,—consisting, Firstly, (as regards gas metres generally,) in the employment of "naptha," distilled from "coal tar," or "coal oil," as it is usually denominated at gas works, as a packing medium, to be used in hydraulic valves or junctions, to prevent the gas escaping from any one compartment of the metre to another; secondly, in a peculiar construction and arrangement of apparatus for measuring volumes of gas passed through the same; thirdly, in a novel arrangement of apparatus for measuring volumes of water or other liquid passed through the same; and fourthly, in an improved construction of slide cock or valve, applicable to all metres used for letting in or turning off the liquid, as may be required.

In Plate XI., fig. 1, is a section, taken vertically through one of the improved construction of metres, in the direction of line *a, b,* fig. 2, for the purpose of shewing the arrangement and construction of the interior parts; fig. 2, is a horizontal section or plan view of the same, the top part or casing of the upper chambers or compartments being removed, to expose the situation of the inlet and outlet valves; fig. 3, is another horizontal section, taken lower down or in the line *c, d,* in fig. 1. In these figures, the gas is passing into one receiving chamber, and filling it, while the other is discharging; fig. 4, is also a vertical cross section, but showing the parts of the metre in another

situation, or after a change has taken place in the valves; that is, the chamber, which in fig. 1, is shewn as a receiving chamber. In this figure is the discharging chamber, and that which was the discharging chamber has, in this position, become the receiving chamber.

A, A, is the outer casing of the meter, which, as well as the various other parts, may be made of block tin, pure tin, zinc, lead, or other suitable metal; B, is the inlet aperture or gas pipe, leading from the gasometer or other reservoir; C, is the discharge or exit pipe, from the meter to the burners; D, is one of the alternately receiving and discharging chambers, formed by part of the outer casing; and E, is another chamber for a similar purpose.—This chamber is constructed as a small gasometer or gas holder, placed within the other chamber D, or outer casing, and may be said to act as a hollow piston within the other chamber, as its cylinder,—the lower edges of this gasometer descending into the hydraulic packing F, F, to prevent the escape of gas from one chamber to the other. This liquid packing is either naptha or coal oil, and is contained in a circular recess or space, between the outer casing A, and another chamber G, which is a general exit chamber or compartment, for both the receiving chambers D, and E; the contents of both these chambers passing into it previous to escaping to the burners; and is intended to prevent or obviate any flickering of the lights, when the valves shift and change the passage of the gas from one chamber to another. H*, H, and I*, I, are the changing valves, placed in their chambers K, and L. On the top of the chamber D, the valves are formed as cups *a, a,* and are mounted on the ends of levers *b, b,* having their fulcra on the cross axis or shaft *c,* which is immersed in the liquid packing or medium *d, d,* contained within the chambers K and L; the

end of this axis may be passed through proper stuffing-boxes in the sides of the chamber, and the required registering movement taken from the end thereof, if required.

The edges of the cross valves, when down or closed, dip into the liquid packing *d, d,* and prevent the gas passing through the several apertures, as the case may be. M, is an exit pipe, leading from the chamber L, downwards to the chamber G; and N, is another pipe, leading from one of the valves I, to the chamber E; O, is another pipe or tube, leading from one of the valves H, into the chamber E. The other valves H*, and I*, are only apertures in the top of the chamber D, and furnished with projecting rings or ledges around them, over which the cup-valves H*, and I*, close, when their edges descend into the liquid packing *d*; *f*, is a syphon, for regulating the height of the liquid packing *d*, in the chambers K, and L; and *g*, is another syphon valve, to regulate the height of the hydraulic packing F, between the chamber G, and D. *i*, is a hollow weighted tube, mounted, rocking on the centre or fulcrum at *k*; this tube is closed at both ends, and contains a ball or metal bullet, capable of rolling or moving freely within it. One end of this tube has a weight *l*, attached to it, and at the other end is connected the counter-balance chain *m, m,* which also serves to draw down or pull over the valves and levers *b, b,* when the chamber E, has descended to the extent of its movement; the other end of this chain being attached to the top of this chamber. This chain is furnished with an adjusting screw and nut, at *m**, for the purpose of regulating the extent of motion of the chamber E. On the upper part of this tube are mounted the two arms or forks *n, n**; one or the other of which act upon the short end of the bell-crank or right angle lever *o*, mounted on a pin or stud, as its axle or fulcrum; the other or longer end being connected by proper joints, by means of the bridle-

piece *p*, attached to one of the shifting or changing valves H. *q*, is a tappet-piece, fixed on to the top of the chamber E; which, as the chamber rises, comes into contact with the under side of the tube *i*, and raising it, causes one of the forked arms *n*, to come into contact with the short arm of the lever *o*, and shift the valves. *r*, is a guide rod, moving through a tube *s*, which is passed air-tight through the chamber K, and then serves to guide the gasometer chamber E, in its movements. This tube is covered in by an air-tight cap-piece *t*, which may be said to form a part of the chamber D, as an open communication may be made between them.

It will be found requisite, in a well-regulated metre, to supply a couter-balance weight to the chamber E, for the purpose of preventing any difference in the lights when this chamber is descending or ascending; as in the former case, the expansive force of the gas will have to overcome its weight in raising it up, and the gravitating power or weight would be in favour of the pressure of the gas in its descent.

In figs. 1 and 4, *u*, is a rod, attached at its upper end to the top of the chamber E, its lower end being connected to a chain, passed over a pulley *v*, and carrying, at its other extremity, a counter-balance weight *w*, equal to the weight of the chamber E, and its rod *r*, and tappet *q*. This weight acts within a tube *x*, passed air-tight through the chamber G; and as regards its holding of gas, may be called part of the chamber E. *y*, is a cock, for the purpose of drawing off any superabundant quantity of liquid packing which may be in the chamber G. The action of the metre is as follows:—

Supposing the parts to be in the position shewn in figs. 1 and 2, the gas will be entering the compartment K, by means of the inlet pipe B, and flowing into this chamber, it will be free to pass through the open valve H, down the

pipe O, as shewn by the arrows, into the moving chamber or gasometer E, which chamber will rise under the pressure of the gas, until the tappet piece *q*, comes into contact with the under side of the tube *i*, when, as before stated, it will lift it and shift the valves;—the gas contained in the compartment or chamber D, being forced therefrom (as the gasometer E, rises) through the open valve or aperture H,* into the chamber L, from which chamber it will flow through the pipe M, into the general receiving chamber G, from whence it will pass off by the outlet pipe C, to the burners.

As soon as the end of the tube *i*, has been forced upwards beyond the horizontal line, the bullet or running weight within it, will pass from this end of the tube to the other, and by its weight cause the other end to descend very quickly, and bring the tappet or forked piece *n*, into contact with the short end of the lever *o*, and force it towards the right hand; and this movement, by means of the other or longer arm of the lever and connecting piece *p*, will draw down and close the valves H, H,* and consequently raise the other valves I and I,* and thus change the valves and chambers into the position shewn in fig. 4; and as the valves and chambers are changed alternately, the number of these movements are to be registered by a train of toothed wheels, dials and indices, as usual: the cubical contents of each chamber, or the quantity of gas passed through the meter, between each change, being the amount to be ascertained and registered.

Fig. 5, is a cross section, taken vertically, of one of the improved water or liquid meters. In this meter, the chambers which receive the water or liquid, have a tilting or rocking movement given to them upon an axis, which movement is caused by the superior gravity of one chamber when filled over the other, when empty, and may be

called self-acting, as they open their discharge valves at the required moment, to let out the quantity of liquid contained therein to be registered, while the valve of the opposite or empty chamber closes, ready to receive its charge or quantity of fluid. The registering movement for this meter, may be taken from the axis or fulcrum of the rocking or tilting chambers.

In fig. 5, the supply and discharge pipe for the liquid, are shewn in sections, with the improved slide cock or valve, to be after described, adapted thereto: A, A, is the outer chamber or casing of the meter, which may be open or closed to prevent the evaporation of spirituous liquids. B, is the inlet or supply-pipe, leading from the reservoir or vat into the vertical tube C, which contains the supply, and shutting-off cocks D, and E, connected together by the rod F. The cocks are shewn in the drawing as open, and the liquid will therefore be free to flow out of the pipe B, into the pipe C, and off to the meter, by the branch supply-pipe G, its end being open. H, and I, are the two measuring chambers, mounted upon one bottom plate K, which is securely attached to the axis or fulcrum at L. The other two chambers are divided by a partition plate M, and are each furnished at the bottom part with a valve or cock N, N, mounted on proper seats, with rods, bearings, and guides. O, O, are stop-pieces, placed on the bottom of the meter, against which the lower ends of the rods of the valves come into contact, whenever the chambers fall over or tilt by the superior gravity of the liquid contained therein. P, P, are floats, mounted on lever arms Q, Q, having the fulcrum on an axis turning in proper bearings in the casing: these floats rest on stationary pins or studs R, until the liquid rises up in the chamber a sufficient height to float them and effect the releasing of the chamber and discharge of the liquid, which is held by the following contrivance, until

the proper or required quantity has entered. S, S, are short arms or catch-pieces on the levers Q, which come into contact with stop-pins T, T; these pins are furnished with adjustable screws, by which the exact point is known at which the catch-pieces S, shall be released from the pins T, and consequently the quantity of liquid that shall be received into the measuring chambers.

It will be seen, that these chambers are prevented from tilting over or discharging, until the stop S, has escaped from the pin T; and that when the liquid rises high enough to lift the floats P, they will depress the catch-piece S, until it escapes past the pin T,, when the now filled chamber will fall over and discharge itself of its contents by the rod of its valve N, coming into contact with the stop O, and thus open its valve, and the liquid will be free to flow out of the meter by the discharge-pipe U, to the proper receiver. At the same time that the one chamber falls over and discharges, the other rises, its valve closing, and its catch-pin S, passing the end of the pin T, comes into contact with it, and locks the chambers in this position, until the liquid passes into the next chamber, and raises its float, and discharges its catch, as before described.

Fig. 6, is a section, on an enlarged scale, of one of the improved slide cocks or valves. *a, a,* is the tube or barrel of the cock *b, b,* the supply-pipe leading from a gasometer, vat, or reservoir of fluid, or liquid: the end of this pipe embraces the tube with a hollow channel or chamber *c, c,* and around the pipe or barrel *a,* at this part, are pierced a number of holes or apertures *d, d,* through which the liquid has free passage to the discharge aperture at *c,* whenever the cock is open, as shewn in this figure: *f, g, f,* is the slide cock or valve, which in this instance is moved up and down its barrel by means of the connecting rod *h,* and lever *i,* which has its fulcrum at *k*; but the slide cock

or valve, may be moved by male and female screws, or a rack and pinion, or any other convenient manner. The slide valve is composed of the middle piece of wood or metal *g*, and two caps of leather or other elastic material *f*, *f*, which are secured to the middle piece *g*, by plates and screw nuts at *k*, *k*; these elastic pieces press against the interior of the barrel, and render the valve water-tight; and between them there is a space *l*, *l*, left, which, when the cock or valve is closed, will be brought opposite the apertures *d*, and the channel *c*, of the pipe *b*; and the two elastic pieces *f*, being one above and the other below it, will effectually close the cock and prevent the liquid from discharging.—[*Inrolled at the Petty Bag Office, August*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To William Ash, *of Sheffield, in the county of York, manufacturer, for an invention of certain improvements in augers or tools for boring, being a communication.* [Sealed 24th June, 1840.]

These improvements in augers or tools for boring, are designed to afford the means of producing by one instrument holes or borings of various diameters, which may be effected by detaching and changing the cutting and guiding parts, and attaching other cutting and guiding parts of various sizes, suited to the particular diameter of the hole required. These improvements also allow of the cutters being readily sharpened, or, in case of being broken, other cutters may be applied to the same instrument.

In Plate XII., figs. 1, 2, and 3, represent the improved auger, complete, in three different positions; and fig. 4,

shews the appearance of its end; *a,* is the shaft shank or spindle, having a conical screw *b,* cut on its point; *c, c,* is a helical or worm-shaped piece, fitted on to the spindle, for the purpose of constituting a guide to the auger, while in the act of boring; and also for conducting and discharging the chips. The upper end of the worm-piece, when attached to the shank or spindle, is made to bear against a stop *d,* fixed into the spindle. Through the shank, near its lower end, a mortice *e,* is made for the reception of the cutter *f,* and the wedge-piece *g,* by which the cutter is made fast in the shank.

The cutter *f,* is shewn detached in four positions, at figs. 5, in order to exhibit its form perfectly. When inserted into the mortice *e,* in the shank, the cutter is secured by the wedge *g,* driven into the mortice through the shank above the cutter. The lower end of the worm-piece bears against the back part of the cutter, and it is further confined by the wedge *g,* which rests in a notch cut in the face of the worm-piece at *h.*

On withdrawing this wedge *g,* the cutter may be taken out of the mortice, and the worm-piece *c,* may also be removed, when another worm-piece and cutter of larger or smaller size, may be attached to the shank or spindle for boring holes of other diameters; and this mode of attaching and detaching the cutter will allow also of its being sharpened upon an ordinary grindstone, whenever the cutting edge shall require it.

Instead of the worm-piece or guide *c,* a guide is sometimes substituted, as shewn in fig. 6, which is a vertical section, and fig. 7, a horizontal view of the same.

This guide, it will be perceived, consists of a ring *k, k,* having a screw-thread, slightly conical on its outside, from which two wings *i, i,* extend, for the purpose of supporting a thimble or tube *l.*

Through this thimble, the spindle *a*, of the auger must be passed, and the cutter being applied to that part of the wood in which a hole is required to be bored, the commencement or opening only of the orifice, is to be cut in the first instance, and then the ring of the guide screwed firmly into that orifice. In the progress of the operation of boring, the cutter will, as it advances, be directed by the spindle sliding through the thimble.

In the first described apparatus, the chips from the cutter will be conducted out of the hole or boring, by the rotation of the worm-guide; in the second described apparatus, the chips will fall or rise through the opening, between the ring *k*, and the thimble *l*.

The patentee claims the peculiar construction of the different parts, as shewn in the drawing; that is to say, the application of moveable cutters and guides of different sizes, which may be adapted to, or detached from, and others added to the spindle, according to circumstances, in order to bore holes of different diameters, and to facilitate the sharpening of the cutters when required.—[*Inrolled at the Petty Bag Office, December,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To Miles Berry, *of Chancery-lane, in the county of Middlesex, patent agent, for certain improvements in the arrangement, construction, and mode of applying certain apparatus for propelling ships and vessels,—being a communication.*—[Sealed 14th August, 1840.]

This invention consists in constructing the bow or fore part of the boat or other vessel, so as to allow of the screw or other propellers, being placed therein, which are in-

tended by their particular position and mode of action, to draw the water directly from the bow, and give it as it passes towards the stern, such a direction, as shall greatly diminish the resistance offered to the passage of the boat.

In Plate XI., fig. 1, is a plan view of the bow of the boat, furnished with two screw propellers, constructed upon this plan; fig. 2, is a side view of the same. *a, a,* are two spiral or screw propellers, such as would be placed on a canal boat, measuring about 15 feet in width and 90 feet in length. For a boat of this size, the propellers may be made about 7 feet in diameter and about 12 feet in length. These screw propellers, are represented as having each four spiral threads, one being a right, and the other a left-handed screw. The threads wind at an angle of about 45 degrees, and taper from the centre towards either end, where they are rounded. Their shafts incline towards each other as they approach the bow, so as to be about 5 feet apart at their fore, and 9 feet at their rear ends. They have their fore-bearings attached to the guard or bow-timbers, near the stern of the boat; their aft ends may pass through stuffing boxes, or be in any other similar manner connected to the driving machinery. Instead of using continuous threads, they may be divided into segments of five, six, or more inches in width, as has been frequently done in propelling vessels. The dimensions given, are intended merely as practical guides, deduced from experiments, but they may be varied in any degree, which further trials may justify.

The bottom of the boat may be carried forward under the propellers, so that its fore end stands immediately under the prow, as shewn at *b*, fig. 2. These propellers, when working, may be wholly or partially immersed, according to the depth of the water.

Fig. 3, is a plan view, shewing a modification of this

method of propelling boats. Although screw propellers have been hitherto mentioned, (being the best adapted to the purpose of propelling on this plan), yet two wheels, resembling the ordinary paddle wheels, may be substituted, with axles, placed horizontally, but forming an obtuse angle with each other; causing their action to be in the same direction as the shafts of the screw propellers. The bottom and bows of the boat, must, in this case, be so formed, as to adapt them to the reception of such wheels. The object of arranging the propellers, so that they shall not act in the direction of, or parallel to the keel, but outwards toward the bilge, is, that they may withdraw the water from the bows of the vessel, and give it a direction, which will lessen its retarding action, and carry it directly to the stern; by which means, it is stated, the waters will be left more smooth and undisturbed than by any other mode of propelling.

The patentee claims the manner of locating the two propellers in the bows of the boat, or vessel, and causing them to act upon the water, in a direction inclined from each other, in the manner and for the purpose herein set forth.—[*Inrolled at the Rolls Chapel Office, February,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM RYDER, *of Bolton, in the county of Lancaster, roller and spindle-maker, for an invention of certain improved apparatus for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other like articles, in metal.*—[Sealed 8th February, 1841.]

THIS improved apparatus, for forging, drawing, moulding, or forming spindles, rollers, bolts, &c., in metal, consists

of a novel combination of mechanism, designed for the purpose of effecting these several operations, by mechanical power, instead of manual labour, as hitherto done.

The principal object of the present invention, is to forge, draw down, mould, or form spindles, shafts, &c., whilst in a heated state, by means of a continuous succession of blows, rapidly performed by hammers, and to give the required form to the spindle or other article under operation, by placing it under the striking or forging apparatus, during the rotation or action of the machinery, which will complete the necessary form or shape of the article under operation, in a much more perfect and economical manner than hitherto accomplished by hand labour.

The drawings in Plate XII., represent such apparatus as should be employed for forging spindles, rollers, &c., for cotton machinery, or articles for other light uses; but if required for heavier work, the machinery must be made of proportionable strength.

Fig. 1, represents a side elevation of the improved apparatus; fig. 2, a front view; and fig. 3, a transverse section, taken vertically through the same. An iron frame-work *a, a,* suitably connected together by means of cross bearers *b, b,* supports, in pedestals, the driving shaft *c, c*; upon one end of which are keyed the fast and loose strap pullies *d, d,* and upon the reverse end, the balance or fly-wheel *e*.

Upon this shaft *c*, a series of excentric cams or cranks *f, f,* are either forged or otherwise conveniently fixed, revolving with it, and bearing in bed or cradle-pieces *g, g,* which vibrate slightly, as the excentrics revolve above them, and bear, at their lower extremities, upon the upper ends of the punches or bars *h, h,* and thus cause them to descend rapidly at every revolution of the excentrics or cams *f, f,*—their instantaneous ascent being alternately effected by means of the springs *i, i*; one end of which

bears against the cross bearer *b*, the other being placed in the punch or bar *h*.

Thus it will be observed, that this series of punches or bars *h*, *h*, are made alternately to slide up and down in the guides or cross-bearers *b*, *b*, at every revolution of the driving shaft, and perform a rapid reciprocating action.

There are similar bottom bars *k*, *k*, which are also supported by the cross-bearers *b*, *b*, their lower extremities bearing upon suitable elastic or spring beds *l*, *l*. These beds are intended slightly to relieve any sudden concussion between the hammers *h*, *h*, and the anvils *k*, *k*, during the forging operation.

Pairs of dies, swages, or hammers, *m*, *m*, of any suitable form, are placed, respectively, at the extremities of the bars *h*, *h*, and *k*, *k*; into or between which, the heated rod or bar to be forged, drawn, or moulded, is placed by the operator, and supported upon the adjustable rest *n*, *n*, as shewn by dotted lines in fig. 3, and there being held and turned by the hands of the workman, as in the ordinary manner of forging iron, the machinery being in motion, the forging or hammering apparatus will operate rapidly upon the heated shaft.

The essential parts of this apparatus are also shewn detached at fig. 4,—being the excentric *f*, and driving shaft *c*, the vibrating cradle-piece *g*, and the punch or hammer *h*. The punch, in this instance, is somewhat modified, being provided with an internal spring *o*, to effect its ascent, after every stroke, in place of bow-springs *i*.

The apparatus may also be conveniently furnished with a pair of cutting dies or shears *p*, *p*, to pare or cut the ends of shafts, rollers, &c., if required, being worked by the operator pulling the hand-lever *q*, and thus raising the lower cutter *p*, by means of the excentric *r*, or in any other convenient manner.

The patentee claims the improved apparatus for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other like articles, in metal; and more especially the mechanical combination of the excentric cam or crank *f*, with the cradle-piece *g*, the top and bottom punch-bars or swage-holders *h*, and *k*, with their swages; also the use or employment of a spring, as at *i*, for the purpose of lifting or keeping up the punch *h*, and cradle-piece *g*, against the excentric *f*, and the elastic spring-bed *l*, when employed for these purposes, in whatever manner the construction, form, or dimensions of the apparatus, may be modified or varied.—[*Inrolled at the Rolls Chapel Office, August*, 1841.]

Specification drawn by Messrs. Newton and Berry.

To CHARLES FARINA, *of Clarendon-place, Maida Vale, in the county of Middlesex, Gent., for his invention of an improved process, to be used in obtaining fermentable matter from grain, and in manufacturing the same for various useful purposes.*—[Sealed 18th April, 1837.]

THIS invention is described as consisting of an improved process, commencing with the malting and continuing with the mashing of grain, in air-tight vessels; whereby, the patentee says, he is enabled to obtain a greater quantity of fermentable matter than by any process or processes now in use; and also in further continuing the process through various air-tight, heating, filtering, and cooling apparatuses, for the purpose of manufacturing the said fermentable matters into beer, porter, and the like malt liquors.

The specification is accompanied with a drawing, representing various views of the apparatus required; but, as the patentee does not confine himself to the precise arrange-

ment set forth therein, although claiming the broad principle of conducting the various processes in air-tight vessels, we have not thought it necessary to present a view of the apparatus.

The patentee says:—The improved process is also applicable to the manufacture of spirits, vinegar, and such other articles as require the previous production of fermentable matter; and claims the same, so far as they are applicable as aforesaid.

The claims set forth, are, firstly, as regards malt,—placing the grain on underground growing floors, and then on the other floors, one over the other, and introducing and regulating the heat under them, and stirring the grain upon them, whereby a great economy is effected; secondly, as regards fermentable matters,—mashing grain, ground exceedingly fine, (that is, as fine as it can be ground in an ordinary malting mill,) in a steam-tight mashing tun and underback, and applying heat all round them the while, by means of their respective outer jackets; and when sufficiently mashed, discharging the whole contents of the mashing tun, grains and all, at once into the underback; thirdly, as regards the manufacturing the said fermentable matter, when obtained, into beer, ale, porter, and other the like liquors; working it generally through its various processes in air-tight apparatuses, whereby he is enabled to brew malt liquors without any exposure of the worts to the external atmospheric air; and fourthly, filtering the worts, after boiling them with hops, and condensing the steam arising from the boiling, and returning the same into the boiler.—[*Inrolled in the Inrolment Office, October*, 1837.]

To John Leigh, *of Manchester, in the county of Lancaster, surgeon, for an improved mode of obtaining carbonate of lead, commonly called white lead.*—[Sealed 28th February, 1839.]

This invention consists in producing carbonate of lead, or white lead, by the decomposition of some of the compounds of lead, by certain substances, not hitherto employed for that purpose. The process is as follows:—

Take a quantity of lead ore, (galena,) say eighty-nine hundred weight, and reduce it to a moderately fine powder; to this, add as much dilute nitric acid as will dissolve the lead of the galena, and by the aid of a gentle heat, the acid and galena, readily act on each other, and form nitrate of lead.—When the solution thus formed, becomes clear, a concentrated solution of common salt must be added, as long as any precipitation of chloride of lead takes place; and, when the chloride of lead has subsided, the supernatant liquor is drawn off, and the chloride of lead washed with fair water, adding the first washings of the previously decanted liquor, which consists of a solution of nitrate of soda.

The patentee does not confine himself to this method of making chloride of lead, as it may be made in various other ways. To the chloride of lead, (however manufactured,) there must be added a quantity of the purified liquor, prepared from the ammoniacal liquor, obtained from the manufacture of coal gas, or of the purified liquor, obtained from putrescent human urine, or of the purified matters, resulting from the distillation of bones, and other animal matters. These purified liquors, are prepared in the following manner;—the ammoniacal liquor obtained

from the manufacture of gas, is placed in a distilling apparatus, care being taken previously to remove any tarry matter that might be found with it; the distilling apparatus, which may be a common waggon-shaped boiler, is connected to a receiver, which should be kept cool, and about one-third of the quantity of liquor is to be distilled over by a gentle heat, somewhat below boiling. By this operation, all the volatile salts, contained in the gas liquor, will pass over into the receiver, which will be found to contain a moderately concentrated solution of carbonate of ammonia, mixed with a little hydrosulphate and hydrocyanate of ammonia, and should any oil appear in the liquid, it must be carefully removed. To this liquor, some salt of lead (carbonate in preference) must be added, in a state of powder, as long as any blackness is produced. The sulphur is thereby separated from the liquid, and a sulphuret of lead thus formed, may be decomposed by dilute nitric acid; and when the salt of lead ceases to be coloured by the liquid, the latter should be allowed to stand till clear, and then poured off from the precipitate; but if not sufficiently colourless, distil it again, and it will be ready for use. When any solid carbonate of ammonia forms on the sides or top of the receiver, it should be dissolved in the liquid product of distillation; the salt may be procured solid by repeatedly distilling the crude gas liquor; the solid salt, mixed with a quantity of animal charcoal, is then introduced into a proper apparatus, and carbonate of ammonia obtained very pure, and a solution of this product in water, will form a fluid fit for use. When wine is employed, instead of gas liquor, it must stand a few days in a covered vessel; then placed in the distilling apparatus, and about three parts of the whole distilled over, when the product will consist principally of carbonate of ammonia; a little carbonate of lead should be mixed with this to separate any sulphur from it, and any

oily matters must be removed; then the liquor is drawn off, re-distilled, and is then fit for use.

When bones or other solid animal matters are used, they must be placed in an iron retort, connected with a series of receivers, and the products obtained will be solid and liquid, consisting of solid carbonate, hydrosulphate, and hydrocyanate of ammonia, and much oil. The oil should be carefully removed, the liquid portion freed from sulphur and re-distilled, till sufficiently colourless,—whilst the solid portion, mixed with animal charcoal, may be sublimed,—then dissolved in water, and freed from sulphur, if necessary.

Having described his method of preparing these ammoniacal solutions, the patentee proceeds to state in what way they are used in the manufacture of white lead.—

Any of these solutions are gradually added to the washed chloride of lead, which is to be kept constantly stirred, as long as any decomposition continues. The chloride of lead and the liquors remain together for twenty or thirty-six hours, by which time, if occasionally stirred, the decomposition of the metal will be completed,—the lead being converted into a mixed carbonate and hydrated oxide, and the ammonia into a muriate.—This process should be carried on in broad shallow vessels, and after the materials have settled, the liquor must be drawn off, and the carbonate and hydrated oxide washed with water.

The quantity of purified gas liquor, or other ammoniacal solutions, required for decomposing a certain weight of lead, will of course vary with the strength of the liquor, and may be easily ascertained. The patentee says, that he finds the chloride of lead obtained from the quantity of galena, above mentioned, is decomposed by the purified liquor obtained from 7466 gallons of crude gas liquor. When the mixed carbonate and oxide of lead has been washed, a current of

carbonic acid gas is to be passed through it, so as to convert it into a perfect carbonate.

Instead of the chloride, sulphate of lead may be employed, precisely the same processes being required; and the result will be, sulphate of ammonia, and a mixture of carbonate and hydrated oxide of lead, which must be perfectly carbonated by carbonic acid gas. Sulphate of lead may be produced by the mutual decomposition of acetate of lead and sulphate of alumina and potassa, or by the decomposition of any of the soluble salts of lead, by the alkaline or soluble earthy sulphates, or sulphuric acid.

Instead of using the chloride or sulphate of lead, as above described, a solution of nitrate or acetate of lead may be added gradually to the purified ammoniacal liquors; the result will be a perfect carbonate of lead by precipitation; and a solution of nitrate or acetate of ammonia; and when the carbonate has subsided, the supernatant liquor is to be drawn off, and the carbonate washed, and prepared in the usual manner.

The sulphate or chloride of lead is decomposed by another process, by gradually pouring upon it a solution of sesqui-carbonate or bi-carbonate of ammonia, in the following proportions:—for every 140 parts of chloride of lead or 152 of the sulphate, add 59 parts of the sesqui-carbonate of ammonia, or 79 parts of the bi-carbonate,—the result will be perfect carbonate of lead and sulphate, or muriate of ammonia.

The patentee says, he does not claim "the mode of decomposing nitrate of lead by common salt, nor any particular mode of forming chloride or sulphate of lead, nor the method of converting the mixed carbonate and hydrated oxide of lead, into pure carbonate of lead;" but he claims "the production of nitrate of lead from nitric acid and galena; and also the mode of decomposing the chloride, ni-

trate, sulphate, or acetate of lead, by purified gas liquor, or liquor distilled from urine, or matters obtained from bones and other animal substances;" and he also claims "decomposing the sulphate or chloride of lead, by a solution of sesqui-carbonate or bi-carbonate of ammonia, whereby the use of carbonic acid gas is not required." He further says, he does not claim "the mode of concentrating the gas liquor by distillation," but he does claim "the mode of purifying it by distilling it, and separating the sulphur by means of a metallic salt, by which it is made fit for the manufacture of carbonate of lead."—[*Inrolled in the Inrolment Office, August*, 1839.]

To HUGH LEE PATTINSON, *of Bensham Grove, Durham, manufacturing chemist, for improvements in the manufacture of white lead.*—[Sealed 10th September, 1840.]

THIS invention consists in the application of carbonate of lime to certain salts of lead, so as to produce a decomposition of the said salts of lead, and a reciprocal exchange of acids and bases between the carbonate of lime and the salt of lead employed. By this chemical re-action, carbonate of lead, or white lead, and a solution of lime, are obtained;—the composition of the latter depends upon the particular salt of lead made use of in the process.

The salts of leads employed, are the chloride and the nitrate; and in order to make the invention more perfectly understood, the patentee has detailed the chemical phenomena which takes place when carbonate of lime and chloride of lead re-act upon each other; but, as our space is rather limited, we must pass on to a description of the practical means required to manufacture white lead, according to the improved process.

The patentee uses a mill, of the following construction, to triturate the materials of which the white lead is composed. It consists of a strong wooden tub, secured with iron hoops, the bottom of which is formed of blocks of hard stone, firmly cemented together, so as to present a level surface. Other larger blocks, of the same kind of stone, are carried round upon this bed, by machinery, so that any hard and brittle substances, when placed in the tub with water, are continually rubbed under it, until reduced to the finest powder.

This description of mill is employed, because it continually mixes, and rubs together, the materials submitted to its action. Care should be taken that no iron, employed in the construction of the mill, may be so situated as to be liable to act upon the bodies to be ground; and where metallic fastenings are required, copper may be used. Into a mill of this kind, 12 feet diameter, and 3 feet deep, put twenty-one hundred weight of chloride of lead, and seven and a half hundred weight of carbonate of lime, in the form of the best washed chalk or whiting; then partly fill the tub with water, and put the mill in motion. After the materials have been ground, from four to six hours, cease grinding, and add more water, until the tub is nearly full; then suffer the whole to stand till the next morning, when a white mass, consisting of carbonate of lead, mixed with undecomposed carbonate of lime and chloride of lead, will be found at the bottom of the tub, and above this a clear liquor, which is a strong solution of chloride of calcium, nearly free from lead. This solution must be drawn off, by means of a syphon or plug, and as much fresh water added as the tub will conveniently hold; then the grinding is renewed for a few hours; and when stopped, the materials are allowed to settle as before, and the solution again drawn off, and fresh water added, the

grinding being continued again for a few more hours. The process is continued, day after day, in this manner, the supernatant liquor becoming every day a weaker solution of calcium, nearly free from lead, until at the end of seven or fourteen days it is nearly tasteless, when the decomposition is considered to be complete, and the white mass, at the bottom of the tub, will have become very nearly a pure carbonate of lead; in which state it is removed from the tub, and dried and prepared for the market, in the usual manner.

The above process may be modified, by employing an excess of chloride of lead; say twenty-four hundred weight of lead to seven and a half hundred weight of carbonate of lime, and grinding and washing the mixture in the manner above described, until all the lime is removed, which is easily ascertained by the liquor ceasing to taste bitter. When this is fully effected, the excess of chloride of lead is converted into carbonate of lead, by adding about four hundred weight of crystals of soda or soda ash, or carbonate of potash. The alkaline carbonate should be used a little in excess, and the grinding is continued, until all the chloride of lime is converted into a carbonate; and the chloride of sodium or potassium, produced by the excess of the alkaline carbonate, is removed by washing. By this means, the duration of the process is shortened, and a purer carbonate is produced; but an additional expense is incurred by using the alkaline carbonate; and, besides this, there is a disadvantage attending this latter process, as, before all the lime can be removed by washing, a portion of the chloride of lead is apt to dissolve; but it may be recovered by precipitating the latter washings by means of any of the sulphurets of soda or potash.

When the patentee uses water, impregnated with carbonic acid gas, instead of grinding the materials together,

as above described, he employs the following apparatus:—

A barrel, made of lead, wood, or copper, strongly hooped with iron, and of any convenient size, is mounted on gudgeons; to one of which, a fast and loose pulley are connected, and rotary motion is communicated thereto from machinery, by means of a band. The other gudgeon is made hollow, and communicates with the interior of the barrel; it is also furnished with a stop-cock, and, by means of a screw-joint, may be connected to a force-pump, for the purpose of forcing carbonic acid gas into the barrel.

One hundred and forty pounds of chloride of lead, and fifty pounds of carbonate of lime, are introduced into the barrel, through an aperture made in the end thereof; then the barrel is nearly filled with pure water, and the aperture is closed by means of a screw-plate and leather washer. Carbonic acid gas is then forced into the barrel, by means of the force-pump, until the water is saturated under a pressure of four or five atmospheres; after which, the barrel is made to revolve at the rate of twenty revolutions per minute, and the substances within immediately begin to act upon each other; the carbonic acid solution dissolving the carbonate of lime, and presenting it to the chloride of lead in a better form for decomposition than when solid, or nearly so. This operation is carried on for three or four days; at the expiration of which, the action has advanced so far, that very little chloride of lead, or carbonate of lime remains, and the liquid is a strong solution of chloride of calcium, which, when the insoluble mass is settled, may be removed from the barrel in any convenient manner, and a further quantity of water, impregnated with carbonic acid, must be added, and the barrel set in motion for a day or two longer, until the decomposition is perfected.

When nitrate of lead is used, the same process is adopted with the chloride, except that the exact chemical equivalent

of the two substances is employed. In the grinding tub, twenty-four hundred-weight and nine-tenths of nitrate of lead, and seven and a half hundred-weight of carbonate of lime, are ground together; and in the barrel, one hundred and sixty-six pounds of nitrate of lead, and fifty pounds of carbonate of lime, are introduced. In both cases, the two substances are allowed to re-act upon each other, until the decomposition is complete; after which, the carbonate of lead is removed, and prepared for sale.

The patentee says, that he sometimes makes a solution of carbonate of lime, in water impregnated with carbonic acid gas; and when this is added to a solution of chloride, or nitrate of lead, a pure carbonate of lead is at once precipitated.

Having thus described the invention, and the manner of performing the same, the patentee wishes it to be understood, that he does not confine himself "to the exact processes described, so long as the general character of the invention is retained;" but he claims "the mode of manufacturing white lead, by means of a carbonate of lime, and the chloride or nitrate of lead, as described."—[*Inrolled in the Inrolment Office, March,* 1841.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 216, Vol. XIX.)

March 30, 1841.

The President in the Chair.

"Description of a new Universal Photometer."
By Dr. Charles Schafhaeutl of Munich, Assoc. Inst. C.E.

The inadequacy of the photometric instruments invented by Pictet, Rumford, and others, is universally acknowledged. The

bromide of silver, as used by Sir John Herschell, although extremely sensitive, is only slightly affected by artificial light.

These circumstances induced the author to complete the present instrument, which he contemplated about twelve years since.

The intensity of the undulations of gaseous fluids, as well as that of the air, is proportional to the amplitude of the oscillations, or more properly to the square of the amplitude.

A wave of light striking the retina must create a similar vibratory motion in the nerves of the retina, because the velocity of the molecular movement of the nerves depends upon the force with which they have been struck by the original wave, and if this velocity could be measured, it would show at the same time the intensity of light.

It is scarcely possible to obtain a direct accurate measurement of this velocity, but if the time during which the vibratory motion of the nerves ceases, be ascertained, the velocity of the vibrating molecules, and therefore the intensity of light, may be determined; because the duration of an impression on the retina is dependent on the resistance which the molecules of the nerves oppose to every force striking them; but as this resistance of the nerves increases as the square of the velocity, four times the momentum or intensity is necessary to double the time of duration; or, in other words, the intensity of the pencil of rays is as the square of the time of the duration of that impression made on the nerves of the retina.

The new photometer consists of a brass bar fixed vertically in a stand, carrying at its upper end a small tube in two parts, which may be lengthened from 5 to 10 inches, if requisite. This eye tube has at each end a sliding plate pierced with holes of corresponding diameters. From the bottom of the bar a projecting arm sustains the lower end of a strip of rolled steel, 18 inches long, $\frac{1}{18}$ths inch broad, and $\frac{1}{32}$nd inch thick; this has at the upper end a thin plate pierced with a small hole, corresponding with the holes in the sliders, and standing $\frac{1}{8}$th of an inch from one of them: upon the main bar is a prism with a slit in it, through which the strip of steel passes; this prism can be moved

up or down by a rack and pinion, so as to lengthen or shorten the vibrations of the strip.

The method of using the instrument is to adjust the two holes at the opposite ends of the horizontal eye tube, so that they perfectly correspond, and do not permit any rays of light to enter, unless the plate at the extremity of the spring be pushed aside. The light to be compared is then placed at a certain given distance behind the plate, so that by bringing the axis of the hole which is pierced in it into the axis of the tube, a small pencil of light may enter the pupil of the eye. The prism is then placed at 100 of the scale on the side of the brass bar, and the steel strip caused to vibrate gently. A luminous disc immediately appears, accompanied by scintillations, which are caused by the impressions on the retina being interrupted by dark intervals: the prism is then gradually raised, until the length of the vibrations of the strip being diminished, and the velocity increased, the luminous disc appears perfectly steady and clear. The length of the vibrating portion of the strip is then read off by the verniers marked on the brass rod, and compared with the whole length of the spring, measured from 100, which is considered as unity. The number of the vibrations to be computed from the found length of the spring, are inversely to the numbers of vibrations of the whole length, as the squares of their relative lengths. Hence are constructed the formulæ for calculation, which are given at length in the communication.

A fresh luminous impression is made on the retina as often as the circular aperture in the screen on the top of the spring cuts the axis of the tube. If the duration of the small vibration of the nerves of the retina is shorter than the time of a vibration of the spring, a dark interval appears between the two luminous impressions. In this case the vibration of the spring is shortened until the next impression returns just as the first ceases, and therefore the dark interval disappears; then by measuring the length of the shortened spring, the number of vibrations can be computed, and from them the intensity of the light.

This communication was illustrated by a series of experiments upon different lights, with the Photometer, which was presented by the author to the Institution.

"On the circumstances under which the Explosions of Steam Boilers generally occur, and on the means of preventing them."

By Dr. Schafhaeutl, of Munich, Assoc. Inst. C.E.

In this communication it is assumed, that perhaps not one-tenth of the recorded explosions of steam boilers can be correctly attributed to the overloading of the safety valve, or to the accumulation of too great a pressure of steam in the boiler. The author alludes to the degree of pressure which hollow vessels, even of glass, are capable of sustaining, if the pressure be applied gradually. He found, in repeating the experiments of Cagniard de la Tour, subjecting glass tubes of one or two inches in length, one-fourth part filled with water, hermetically sealed, and immersed in a bath of melted zinc, that they apparently sustained the immense pressure of four hundred atmospheres, without bursting; but if the end of an iron rod was slightly pressed against the extremity of the tube, and the rod caused to vibrate longitudinally, by rubbing it with a leather glove covered with resin, the tube was invariably shattered to pieces.

Hence he concludes, that something more than the simple excess of pressure of steam in the boiler is necessary to cause an explosion, and that a slight vibratory motion alone, communicated suddenly, or at intervals, to the boiler itself, might cause an explosion. From the circumstance of safety valves having been generally found inefficient, he concludes that a force has operated at the instant it was generated in tearing the bottom or sides of the boiler, before it could act upon the safety valve.

From the sudden effect of this force, explosions have been ascribed to the presence of hydrogen, generated by the decomposition of water: but independently of the difficulty of generating a large quantity of hydrogen in such a manner, it could

neither burn nor explode without the presence of a certain quantity of free oxygen, or atmospheric air; and such an explosive mixture would not take fire, even if mixed with 0·7 of its own volume of steam.

The ordinary method of converting water into steam, is by successively adding small portions of caloric to a relatively large body of liquid; but if the operation was reversed, and all the heat imparted to a given quantity of water in one unit of time, an explosive force would be developed at the same moment. For example, if a bar of iron be heated until it is coated with liquid slag, and is then laid upon a globule of water on an anvil, and struck with a hammer, the liquid slag communicates its caloric instantly to the water, becoming solid at the same time that the water is converted into vapour with a loud report. A similar occurrence may take place in a steam boiler when a quantity of water is thrown into contact with an overheated plate, either by a motion of the vessel, or from a portion of the incrustation formed on the bottom or sides becoming loosened. A sudden opening of the safety valve may, under certain circumstances, prove dangerous, or even any rapid increase of heat, which would cause a violent excess of ebullition in the water.

An examination is then entered into of the respective powers of water and of steam, to transmit undulatory motion, and of their compressibility. According to Laplace, the conducting power of steam at four atmospheres and 294·1° Far. is 1041·34511 feet per second, and that of water 6036·88 feet. The ratio of these different velocities is therefore as 1 : 4·5.

In cases of a sudden explosive development of steam, the principal action is directed against the bottom or the sides of the boiler, whence spreading itself through the water, it is finally transmitted through the steam to the safety valve: a wave created by an explosion, even at the surface of the water, would reach the bottom or the sides of the boiler, 4½ times sooner than it would affect the top of the steam chamber: but if it took place at the bottom, the time for the explosive wave to reach the safety valve, would be the sum instead of the difference of both veloci-

ties. Although these relative periods of time may be considered as infinitely small, it is contended that there is sufficient delay (counting from the moment at which the plates begin to yield) to cause the rupture of the material, which would otherwise have yielded by its own elasticity, had the time been greater, as all communication of motion is dependent only on time.

To illustrate the effect of the sudden development of an explosive force upon the plates of a boiler, the author gives the results of a series of experiments made by him upon iron wires, for the purpose of ascertaining the amount of elongation which took place before yielding under the sudden application of a given weight. The result was, that a wire which had resisted a tension of 22 cwt., when gradually applied, broke invariably, without any elongation, when the same force was suddenly applied by a falling body.

Similar experiments with railway bars showed that fibrous iron, which supported a gradual tension, broke by the sudden application of the same force; while close-grained iron, which was incapable of resisting the gradual strain, bore perfectly well that of sudden impact. These facts are worthy of consideration in the selection of iron for boiler plates, where the sudden action of the rending force is to be guarded against.

The details are then given of a series of experiments, illustrating in an ingenious model, by means of an explosive mixture of chlorate of potassa, the effects of explosions at different heights within a boiler.

A careful examination of the circumstances, and the results of his experiments, convince the author that a simple mechanical arrangement, applicable to all boilers, might be introduced, so as to diminish the danger arising from the sudden development of an explosive force. He proposes to connect with the bottom of the boiler, by means of a pipe, an extra safety valve, of a given area, loaded to five-sixths of the absolute cohesive force of the boiler plate. In the event of a sudden development of steam, the first shock would act upon the valve and open it, which would have the effect of depriving the wave generated of its de-

structive force, and at the same time diminish the violence of the second shock from the top of the boiler, having permitted the escape of a portion of the water from the boiler.

The apparatus for conducting the experiments was presented with the communication.

Mr. Parkes stated, that he had been occupied for several years in collecting facts illustrative of the phenomena of steam-boiler explosions. These disasters could not all be referred to one cause. A boiler might be too weak to sustain the pressure within it, and a rupture would be the necessary consequence. But though the simple elastic force of the steam might thus occasionally account for the rending of a boiler, that cause was insufficient to explain many well-known phenomena, such as the projection of an entire boiler from its seat, the separation of a boiler into two parts, the one remaining quiescent, the other being driven to a great distance, &c. He was of opinion, that a very sudden development of force could alone have produced such effects.

Dr. Schafhaeutl had ingeniously shewn that an explosive force, generated under water, would act upon the bottom of the boiler and burst it, before the safety valve could relieve the pressure. The Doctor deduced from Mr. Parkes's theory of "the percussive action of steam," snd his own experiments, that if, from any cause, such as the breaking up of a portion of crust adhering to the bottom of the boiler, a volume of steam, of high elastic force, was suddenly evolved, a rupture of the bottom would be the consequence, or, the boiler might be separated into two parts. Mr. Parkes coincided in this opinion, and cited several examples in support of it.

It appeared to him, that a force different from, and greater than, the simple pressure of the steam, was the principal agent. The Committee of the Franklin Institute, and others, who in their experiments had endeavoured to produce explosions of boilers, had very rarely succeeded, and the effects obtained, fell far short

of those which continually occurred by accident. It might be safely inferred from this fact, that the experimenters had not arrived at the true cause of the ruptures and projections of boilers, otherwise the production of similar effects would not have been difficult.

Describing the sudden development of a volume of steam, from highly heated plates, which no practicable number of safety valves could discharge quickly enough to save a boiler from destruction, he instanced the effects produced by the breaking up of the scale in salt pans. Carbonate and sulphate of lime were separated from brine by evaporation, and adhered very firmly to heated surfaces. A crust of salt frequently formed upon this deposit; the cessation of ebullition (if the deposit occurred over the furnace) was the consequence, and the bottom of the pan became red hot. The manner in which the pan scale was disengaged, was to strike it with the edge of a heavy iron pricker, which allowed the brine to reach the plate; it was also frequently broken through by the expansion and bagging down of the plates, leaving the crust above like an arch. In such cases, the plate was seen for an instant to be red hot, and immediately afterwards an immense column of brine was projected from the pan, the steam evidently being of high momentary elasticity. Mr. Parkes had seen a yard square of scale thus burst, the whole surface of the plate being at a glowing red heat. Had the pan being closed, like a steam boiler, he conceived that the blow of the steam on the roof, bottom, or sides, would have destroyed the vessel.

A thin copper salt pan, at Mr. Parkes's Works, had a hole burst through its bottom by the sudden action of steam thus generated. The spot had no doubt been previously injured by heat. He conceived that similar phenomena might, and frequently did, occur in steam boilers.

A theory hed been adopted by many writers on the explosion of steam boilers, that red-hot iron plates would generate less steam than plates at a less heat. This was founded on the experiments of Leidenfrost, Klaproth, and others, on the length of time requisite to evaporate a small globule of water in a red-hot

spoon. But there was no analogy between the condition of a hot spoon containing a drop of water, and that of a body of water and heated plates in boilers.

Steam of great force would instantly be produced from a thin sheet or wave of water, passing over hot plates, the molecular attraction of a drop falling a short distance upon a plate wonld be destroyed, and the whole be instantly converted into steam of a high momentary elasticity. The theory of the hot spoon experiment, as applied to boilers, had been demonstrated to be fallacious by Dr. Schafhaeutl, in a paper published in the *Mech. Mag.* vol. xxx. No. 799.

The explosion of several boilers had been attributed, and Mr. Parkes thought justly, to a wave of water washing over highly heated plates. He believed that the fatal accident to the "Union" steamer at Hull, was so produced. The boilers of steam vessels were not at that period so well arranged as at present, for preventing the water from flowing to one side, and leaving a portion of the top of the flues dry with the fire beneath. Under such circumstances, the disaster which occurred would be inevitable, on the vessel's coming on an even keel. Mr. Parkes was not of opinion that it required the exposure of a large area of heated metal to effect the separation of a boiler and the projection of the upper half of it; as, in this case, it was the suddenness of the action, no number of safety valves could have deprived the steam of its instantaneous force, so as to have saved the boiler. The entire circumference of large boilers had been frequently divided as clean as a pair of shears would have accomplished the work. These phenomena were evidences of a force very suddenly exerted.

Sudden actions on the surfaces of boilers arose also from other causes than the heating of plates. During the inquiry into the causes of steam vessel accidents, he ascertained that of twenty-three explosions, nineteen occurred on the instant of starting the engines, or whilst the vessels were stationary; three only whilst the engines were at work: the greatest number took place at the moment of admitting the steam upon the piston. He attributed

this effect to the steam's percussive force, which would be as much felt by the boiler as by the piston; if the boiler was weak, and, distended by steam to nearly the bursting point, the shock would be sufficient to cause its rupture. Mr. Parkes then gave several instances of such occurrences.

In 1817, the boiler of a steam vessel at Norwich burst, and killed many persons. Previous to the accident, the boiler leaked in several places; the steam issued copiously from the safety valve, which was evidently very heavily loaded. The engine had scarcely made a revolution before the explosion occurred. By applying the present state of our knowledge to these facts, he felt assured that the steam's impact on the piston had been the immediate cause of that accident.

In 1826 or 1827, Mr. Parkes witnessed the effects of an explosion, a few minutes after its occurrence, in the neighbourhood of his works, near Paris. The boiler was of wrought iron, 6 feet long by about 2 feet 6 inches or 3 feet diameter. By his advice the owner had previously put in a new end, formed of one piece of hammered iron, and he was strongly dissuaded from overloading his engine, or using habitually such enormous pressures. The cylinder of the engine was horizontal, and was connected with the boiler by a short pipe and cock. The proprietor informed him, that finding his machinery working too slowly, he went into the engine-house and stopped the engine. He held down the lever of the safety valve, and on turning the cock to start the engine, the explosion instantly occurred. The new end of the boiler, which was opposite to the engine, was found separated from the body, and lying in the flue. The line of rivets and a complete ring of the new end remained upon the body, apparently little forced, and the faces of the fractured ends were as sharp and clean as if cut by a chisel or shears. The boiler, engine, and masonry, were driven into the yard in the opposite direction to the escape of the water and steam; thus, though the entire end of the boiler was removed, and the whole contents evacuated, it acted too late as a safety valve.

He observed similar effects last year in an explosion at Cam-

den Town, being fortunately on the ground to investigate it before much change had been made. Two boilers were set end to end with a chimney between them. The end of one was blown out, and was lying close to its original seat. It was forced backwards into the chimney, which it partly supported on a pipe flange, and pushed the other boiler and entire masonry in a horizontal direction fully two feet. He considered that the percussion of the steam from its re-action against the opposite ends of the boiler, in the act of tearing it off, (which was the effect in this case) produced the recoil. In this case there were upon the boilers (which were connected together) two safety valves in good order, and not heavily loaded. The accident occurred during the breakfast hour, whilst the engines were not at work. One of the two stays which originally held the fractured end of the boiler, was found to have been previously broken, as its separated ends were covered with old lime scale—the other had evidently been long cracked, and was only held by a fragment. The fractured end of the boiler was not exposed to the fire, nor did the shell or the flue within it exhibit any marks of injury from fire or from dislodgement of scale. The steam, in its effort to escape, acting first against one end, not only raised the boiler from its horizontal position to an angle of about 45°, but gave it a twist obliquely from the line of its bed.

Mr. Parkes could not agree in the often expressed opinion, that what are called high-pressure steam boilers were more dangerous or more liable to explode than others. Much depended on care and management. He believed that he was in possession of accounts of nearly all the explosions which had occurred in Cornwall since the expiration of Mr. Watt's patent, when higher pressures began to be used, and they amounted only to five or six instances, exclusive of some cases of collapsed flues. More explosions had occurred in a small district round Wednesbury during the present year, with low-pressure boilers, than in Cornwall in forty years, where the highest pressures were employed. He believed also that the coal districts of Northumberland, Durham, and Staffordshire, would furnish more cases of these dis-

asters from boilers, both of high and low pressure, than all the rest of England put together.

When the practice in the coal districts was contrasted with that of Cornwall, the explanation was simple. Where coal was so cheap, the quantity used was unlimited, the negligence was great, and the allowance of boiler was small for any given sized engine, as enough steam could be raised by fires of greater intensity—the rule there being, to save in the first cost of the boiler; in Cornwall, on the contrary, the object was to insure economy in the consumption of fuel; consequently, all that class of accidents arising from injury to plates by fire and deposit, would be in about the ratio of the intensity of the combustion.

Notwithstanding the bad practice generally prevailing in the coal districts, there were some exceptions. At an iron-work near Dudley, there were boilers now in good order after nearly thirty years' use, having required but trifling repairs during that period. In those boilers the plates of the bottoms which were exposed to the fire were all made of hammered, not of rolled iron—the boilers were large for their work, and were cleaned thoroughly every week.

Tilted plates were alone used for salt pans in those parts where the heat was most intense. Though continually heated to redness, and distorted by the action of the fire, the quality of the iron in plates thus formed did not appear to be deteriorated, for when taken out the smiths used them for making rivets, nails, &c. Rolled iron plates would do for making coarse salt, which required a heat below ebullition, but they were quickly injured when used for fine salt, and were useless when taken out.

Mr. Parkes then adverted to several other remarkable cases of explosion. It was a well authenticated fact, that a boiler belonging to Messrs. Ferey, at Essonne in France, exploded on the instant of opening the safety valve.

Three successive reports were heard when Steele's steam boat boilers exploded at Lyons, indicating that they did not burst at the same instant. Now, though Mr. Steele had fastened down the safety valve to increase the pressure of the steam, yet the

explosion of the first boiler should, according to the received opinions, have acted as a safety valve to the second and third, and have saved them—for, by the destruction of the first boiler, the pipes would be broken, and a free exit be afforded for the steam in the others; nevertheless, they all three burst in succession. Several similar instances of successive explosions had occurred in England. He would not at present enter upon an explanation of what he considered might have occasioned these phenomena, but he would express his conviction that the practice of suddenly opening and closing the safety valves was extremely dangerous. To be useful as escape valves, they should be allowed to open and to close in obedience to the steam's pressure only,—not to be handled more than was absolutely necessary.

None of the theories yet advanced appeared clearly explanatory of the cause of the projection of heavy boilers from their seats, when in many cases they contained abundance of water. He instanced a case in which a boiler exploded, and carried to some distance a boiler connected with it, and in which some men were at work. The boilers separated while in the air, and the one which exploded attained a very considerable height, although it was 28 feet long by 6 feet diameter. The particulars of this explosion were furnished to him by Mr. Clarke, engineer to the Earl of Durham, but they could not be properly appreciated or explained without the drawings and description.

A boiler weighing about $2\frac{1}{2}$ tons, was projected from its seat at Messrs. Henderson's Woollen Factory at Durham, in 1835; it ascended to a considerable height, and fell 300 yards from the place where it had been seated.

A cylindrical boiler exploded at the Crenver Mine in Cornwall in 1812. It passed through the boiler house, and opened itself in the yard outside, where it was described to have fallen "as flat as a piece of paper."

Facts of this nature were replete with interest, and should lead engineers to the consideration of causes and remedies.

Mr. Parkes then instanced several cases of boilers which had become red hot, and had not exploded; one example was a set

of three boilers, the tops as well as the bottoms of which were red hot, in consequence of the house in which they were fixed being on fire; yet they did not explode. No water had, however, been pumped into the boilers whilst so heated.

He was in possession also of several curious examples of ruptures and projections of vessels arising from causes very different to the foregoing. One case occurred in February 1837, at the Works of Messrs. Samuel Stocks and Son, in the Township of Heaton Norris, near Manchester. The boiler was 20 feet long, 9 feet wide, and 10 feet deep, and weighed about 8 tons. On a Saturday night the water was blown out of it through the plug-hole at the bottom, by the pressure of the steam, the man-lid not being removed. On Sunday evening the fireman proceeded to take off the man-hole cover to clean the boiler; on entering it with a candle and lanthorn, a violent explosion occurred; and the man was projected to some distance and killed. On examining the boiler it was found quite dry, no fire being alight, no traces of water near it, and it was quite cold: it had been lifted from its seat up to the roof, which it destroyed, and the walls of the building were thrown down. There was no difficulty in accounting for the presence of a combustible gas, as hydrogen might be evolved from the decomposition of the steam (which would remain in the boiler after the expulsion of the water) by the heated sides and bed of the boiler, and the atmospheric air which entered through the plug-hole or through the man-hole, when the lid was removed, was sufficient to form an explosive mixture. The projection of the man was the simple effect of firing the gas; but to account for the entire boiler being carried from its seat, was more difficult. The figure of the boiler after explosion, exhibited two distinct actions; the ends and sides had evidently been bulged outwards by the force of the explosion within it, and the bottom had been crushed upwards by the force which raised it from its seat.

Mr. Parkes thought the circumstances admitted of a satisfactory explanation, but would not then enter upon it, as it involved the history and phenomena of projections of vessels from their

beds with a vacuum within them, which he thought would be better understood after the reading of his paper on the "Percussive Force of Steam and other Aeriform Fluids," then in preparation for the Institution.

The foregoing case of the formation of hydrogen gas in a boiler, after all the water had been evacuated, was confirmed by one which took place in a similar manner at the Sugar-house of Messrs. Rhodes and Son, in London, of which all the particulars had been furnished to him by Mr. Henrickson, the manager. A man entering the boiler with a candle and lanthorn to clean it, was projected to a great height. No rupture of the boiler took place, as the quantity of hydrogen seemed to be comparatively small, and to be confined to the upper portion of the boiler, but a series of detonations occurred, like successive discharges of cannon.

These two remarkable instances showed the importance of attending to minute circumstances in the management of boilers. The practice of completely blowing out boilers whilst the flues were intensely heated, was evidently dangerous, nor should it be done without removing the man-hole cover.

Mr. Parkes felt that these notices of explosions were very imperfect without drawings, and reference to documentary evidence, but, as the subject had been brought before the Institution by Dr. Schafhaeutl, he hoped that they would be received as contributions to the stock of knowledge, and as illustrative of the precautions to be observed by attendants on steam engines.

Mr. Seaward was glad to find the idea of the explosions of boilers arising from the formation of hydrogen gas, so successfully combated by Dr. Schafhaeutl and Mr. Parkes. He perfectly agreed with the former in his opinion of the causes of the majority of explosions. In all that he had witnessed the effects of, the lower parts of the boiler appeared to have suffered most.

He was at Polgooth Mine immediately after the explosion there, when seventeen persons were killed. In that case, he was

told that the boilers were moved a distance of 7 or 8 feet from their seats, before any detonation was heard.

At the Hurlam Mine (which Trevithick had undertaken to drain for a certain sum) an engine with a cylinder of 40 inches diameter was erected immediately over the shaft. Its power was not sufficient for the work required; the pressure of steam was therefore gradually increased as the depth became greater. At length the boiler, which was of an immense length, was observed to have a constant tremulous or sinuous motion at each stroke of the engine, and eventually it exploded.

It appeared that there were fewer explosions of boilers in London, in proportion to the number employed, than in any other district. One reason for this might be, that fuel being expensive, it was used economically, by maintaining a slow rate of combustion, and a regular supply of steam, avoiding the intense action of the fire, which, in the event of the engine standing still for a time, had a tendency to produce an explosion.

Mr. Parkes attributed the small number of explosions of boilers in the vessels on the Thames, to the practice of allowing the steam to act upon the safety valve, instead of the engineer lifting it when the engine was stopped, as on board vessels in the north. The sudden closing of the valve had in many cases produced an explosion. While on this subject, he felt it necessary to comment upon what he considered fallacious reasoning of Tredgold on the formation of hydrogen gas in boilers. The passage he alluded to was couched thus:—"Hydrogen gas may be, and frequently is, formed in steam boilers through the water being in contact with a part of the boiler which is red hot; and it seems to be regularly produced during the formation of steam at very high temperatures." Dr. Schafhaeutl had shown, that the effect of water coming suddenly in contact with a part of the boiler which was red hot, was only to disengage instantaneously a large volume of steam of very high elasticity. Mr. Parkes contended, that an instance of the sudden production of hydrogen gas in a boiler, under such circumstances, was unknown, and he much doubted the possibility of such an occurrence. Again,

allowing such an event to be possible, an explosive mixture of gases must be formed before the boiler could be destroyed; and this could not take place so long as a sufficiency of water was present, from which any considerable quantity of steam could be generated.

Mr. Donkin did not entirely agree as to the non-formation of hydrogen in boilers under peculiar circumstances. He conceived the explosions which occurred in iron foundries, on the contact of the melted metal with wet sand, to be analagous. He believed, that when water was thrown suddenly upon red-hot plates, decomposition did occur.

He had once examined a waggon-shaped boiler which had exploded; the top was thrown to some distance, and the bottom was depressed throughout its entire length. He believed, that by intense firing the water had been nearly all evaporated; the bottom had then become red hot, the pressure of the steam had forced the bottom downwards when weakened by the heat; the water on each side then suddenly flowed on to the heated part, and an explosion instantly occurred.

Mr. Seaward had known instances of the internal tube of a boiler being collapsed without any injury to the external part or body of the boiler. He had always ascribed such occurrences to a deficiency of water; but Dr. Schafhaeutl's explanation of the rapid transmission of force through the wave to the bottom, would sufficiently account for the effects which had been observed.

Mr. Donkin believed, that in almost every case the unequal pressure upon the exterior of the tube, arising from its not being perfectly cylindrical, was the cause of its collapsing.

Mr. Field was inclined to attribute all the explosions which he had witnessed, to simple pressure.

When steam, or a small quantity of water, was suddenly admitted into a dry heated vessel, hydrogen gas was readily formed. He had made several sets of apparatus for the purpose. A strong wrought-iron tube was heated, and, being filled loosely with fragments of iron-turnings, steam was introduced, and the gas was rapidly evolved.

He agreed with Mr. Parkes in condemning, generally, the fallacy of the opinion of Tredgold, previously mentioned, as to the formation of hydrogen gas. Still, in a large boiler, almost dry, and of which a portion was red hot, he conceived, that on the admission of a small quantity of water, hydrogen gas might be evolved.

The President was unwilling that this conversation should terminate without endeavouring to explain the cause of the elevation of the boilers from their seats. In his opinion, this might be satisfactorily accounted for by the action of atmospheric pressure.

When an explosion took place in a boiler, a considerable body of highly elastic fluid was disengaged; a partial vacuum was thus created above the boiler, whilst the full pressure of the atmosphere was exerted beneath it. This would cause the boiler to rise from its seat, provided the atmospheric air did not at the same instant rush into it, in which case the bottom would be pressed downwards, and the upper part being torn asunder, as had been described, would then rise into the air with the elastic fluid.

When it was considered that the superficial area of these boilers was about 60 square feet; that the pressure of the atmosphere was nearly 1 ton per square foot, and that the weight of the boilers was only 8 or 10 tons, it would be apparent that the cause was quite adequate to the effect, with a very partial vacuum or inequality of atmospheric pressure. The case was analogous to those in which light bodies were raised into the air by whirlwinds.

He referred also to two cases of an equally uncommon nature, which had lately come under his notice professionally, and which he considered to arise chiefly from inequality of atmospheric pressure.

The first occurred at the Plymouth Breakwater during the great storm in the month of February 1838, when several of the largest granite blocks, weighing from 3 to 8 tons each, composing the surface or pavement of the breakwater, which, although

squared and dove-tailed into the structure, and embedded in excellent cement to the extent of their whole depth, and thus forming a solid mass, were torn from their positions, and projected over the breakwater into the Sound. He attributed this to the hydrostatic pressure exerted beneath the stones, at the moment when the atmospheric pressure above had been disturbed by the masses of water suddenly and rapidly thrown upon the surface of the breakwater. Blocks of stone were thus often carried to a great distance, not so much by the waves lifting them, as by the vacuum created above them by the motion of the water, which exerted at the same time its full pressure from below.

The other case occurred during a storm in the year 1840, when the sea door of the Eddystone Lighthouse was forced outwards, and its strong iron bolts and hinges broken by the atmospheric pressure from within. In this instance, he conceived that the sweep of the vast body of water in motion round the lighthouse, had created a partial and momentary, though effectual, vacuum, and thus enabled the atmospheric pressure within the building, to act upon the only yielding part of the structure.

A letter was read from Mr. Edward Alfred Cowper, describing some experiments on the use of maroons as signals on railways.

The maroons are either small tin cases, or carcases of brown paper, charged with from ½ oz. to 2 oz. of gunpowder, mingled with which are four of "Jones's Prometheans," which are small glass tubes, each containing a drop of sulphuric acid; the tubes are surrounded with chlorate (hyper-oxy-muriate) of potassa, and are each enveloped in a strip of paper.

In the event of an accident occurring, which renders it necessary to give notice that an approaching train should be stopped at a given point, two or more of these maroons are fastened upon the upper surface of the rail by the strips of lead attached to them. The wheels of the engine, in passing over them, crush the glass tubes of the "Prometheans," the sulphuric acid inflames the chlorate of potassa, and causes an explosion of the gun-

powder, which is distinctly heard by the engine driver, who immediately shuts off the steam, and puts down the break.

Mr. C. H. Gregory had permitted several trials to be made with these maroons on the Croydon Railway.

An engine was driven at full speed with a number of empty waggons attached to it, and with the steam blowing off to create as much noise as possible, yet the explosion of even half a drachm of gunpowder was distinctly perceived: he considered the invention to be practically useful.

April 6, 1841.

The PRESIDENT in the Chair.

"Experiments on the strength of Iron Girders."

By Thomas Cubitt, Assoc. Inst. C. E.

This communication gives, in a tabular form, the results of experiments upon upwards of sixty pairs of cast-iron girders, varying in length between 7 feet 6 inches and 27 feet, with corresponding depths, and of all the forms usually adopted for beams for buildings. They were proved in pairs, by a hydarulic press placed between them, the ends being retained by wrought-iron ties. The deflexion was noted at each increase of pressure, and in many instances the beams were fractured.

Sketches of the girders, and of the apparatus used for proving them, accompanied the paper; from them five drawings have been made at the Institution to facilitate a reference to the information contained in the communication.

"Description of an improved Level and Stand."

By G. Townsend.

This improvement being intended to procure a firmer basis and greater facility of adjustment than by the ordinary level, the author has adopted the principle of the triangular plate, with

three levelling screws. In the ordinary instrument, with two pairs of screws, it has been found that the antagonist screws, besides being apt to wear unequally, and to indent the lower plate, are sometimes bent, and thus cause an unequal action upon the upper plate. To obviate these defects, the screws in the tripod level are made to work into inverted cones, which are fixed in the three grooved arms of the stand head; the weight is more equally distributed, and the telescope more speedily brought to a level.

The telescope is fixed to the levelling plate by an upright limb, and to this is added a small longitudinal cross level, as in Gravatt's instrument. In the improved stand, each of the legs is attached to two arms of the lower tripod plate, by which means a firmer basis is obtained. The usual locking plate, to secure the levelling screws, is also attached to this instrument, and kept in place by a spring catch; there is also a metal ring fixed on the upright limb, above the arms, and which falls into three spring catches in the table plate, by which any derangement from accidental violence, or in removal from one station to another, is effectually prevented.

A small circular spirit level is fixed in the stand, in order to adjust it before the instrument be placed on it, by which means the labour of adjustment is considerably abridged.

List of Patents

Granted by the French Government from the 1st of July to the 30th of September, 1840.

(Continued from page 224, Vol. XIX.)

PATENTS FOR TEN YEARS.

To Curtis, of London, for improved machinery for shifting the scenes of theatres.

Dechanot, of Charenton, for improvements in the refining of iron.

Deckberr Brothers, of Montbelliard, for a new method of colouring prints.

Degousée and Co., of Paris, for an improved boring apparatus.

Delosme Brothers, of Marseilles, for improvements in hats.

Delvaux, of Paris, for cards for spinning worsted.

Demars, of Lyons, for a machine for thrashing wheat.

Despiau, of Barbaste, for a machine for making candle-wicks.

Diot, of Lyons, for new means of navigating canals.

Dubochet, of Paris, for an extraction of fibrous substances, to be used in the making of paper.

Dubourg, of Paris, for the preservation of wine and other fermented liquors.

Ducôté, of Louviers, for improvements in carding wool.

Dufay, of Paris, for bleaching of paper which has been written upon.

Durden and Stears, of Paris, for an impermeable tissue.

Faivre, of Paris, for a steam-engine.

Feresse, of Paris, for improvements in the manufacturing of corks.

Fervaecke, of Ghent, for a new loom.

Festugières Brothers and Co. of Perigueux, for a new method of manufacturing sheet iron

Flament, of Béthune, for improvements in motive powers.

Fontaine, of Chartres, for a new water-wheel.

Fresca and Eboli, of Paris, for improvements in the preparation of tallow.

Galibert Father and Son, of Bordeaux, for spinning and weaving of a new substance.

Gentil, of Alfort, for converting into syrup and spirits of wine the residue of potatoes, from which potatoe starch has been made.

Girardin, of Paris, for an improved easy chair.

Girard, of St. Etienne, for improvements in dyeing silks.

Gouttebaron, of Lyons, for improved safety locks.

Guérin, of Paris, for improvements in percussion guns.

Guérin and Nativèle, of Paris, for an improved mode for extracting febrifuge draughts from vegetable substances.

Guillaume and Dorie, of Paris, for improvements in the refining of sugar.

Heindrychx, of Paris, for a new kind of button.

Houzeau Muiron, of Rheims, for an improved method of extracting gas for illumination.

Huguenin and Ducommun, of Mulhausen, for a machine for printing tissues.

Hutin Delatouche, of Erie Château, for a machine for grinding the fatty substances which have been used in the preparing of leather.

Janty, of Wazemmes-les-Lille, for the extracting of the colouring matters contained in dye woods.

Jaume, of Paris, for ovens for baking plaster.

Jouffroy d'Albans, (The Marquis of,) of Paris, for improvements in the construction of carriages.

Julienne and Dumesnil, of Rouen, for the filtering of oils.

Kawthorn, of London, for improved steam generators.

Kestner, Father and Son, of Thann, for improvements in dyeing fabrics.

Kilburn, of London, for the manufacturing of hinges.

Klein, of St. Vit, for the manufacturing of tiles in zinc, glass, asphalte, &c.

Lacombe, of Surba, for improvements on the Catalonian furnaces for reducing iron.

Labouriau, of Paris, for new kinds of embossed paper.

Laurens, of Paris, for steam generators.

Lawford Ackland, of Paris, for pipes in metallic alloy.

Lecter, of Dourdan, for hydraulic machines.

Ledru, of Clermont, for a bituminous cement.

Lehodey, of Paris, for an improved syringe.

Lesséré, of Paris, for a new inkstand.

Levraud, of Nantes, for boxes for preserving alimentary substances.

Lupé and Salmon, of Paris, for revivification of animal charcoal.

Mayner, of Moulins, for instruments for directing the hands on the piano.

Mallet, of St. Quentin, for purifying of coal gas.

Martin, of Paris, for refining of indigo.

Mayer, of Paris, for capsules for receiving nauseous medicines.

Meeus, of Brussels, for improvements in the manufacturing of sugar.

Menotti, of Batignolles, for soap for rendering fabrics waterproof.

Mercier, of Alençon, the Baron, for manufacturing of lace, called "Poins d'Alençon."

Madame Mercket, of Paris, for an improved lamp burner.

Meredith, Winchester, and Harris, of London, for an improved locomotive.

Meuron, of Paris, for a machine for folding woven fabrics.

Miegeville, of Toulouse, for an hydraulic pump.

Miroude, of Rouen, for manufacturing of cords in flax.

Morin, of Paris, for improvements in carriage springs.

Morlière, of Vic, for improvements in the manufacturing of paper.

Muller, of Paris, for a forge for the gilding of metals.

Pelletan, of Paris, for a new distilling apparatus.

Pengcot Brothers, of Hérimoncourt, for a new method of soldering the blades or cutters of planes.

Perrin, of Besançon, for an improved press for crushing vegetable substances.

Perring, of London, for a new weighing machine.

Piéren, of Paris, for a new tea-pot.

Piquet and Corvier, of Cuisery, for a machine for chopping mulberry leaves.

Plataret, of Paris, for silk plush for hats.

Poimbœuf, of Hotelains, for an improved washing machine.

Poitevin, of Paris, for buckles without tongues.

Polonceau, of Paris, for a new system of paving.

Poole, of London, for the preparation and application of colours used in house painting.

Poole, of London, for improvements in the manufacture of gas.

Poole, of London, for improvements in the construction of steam boats.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th September, to the* 18*th of October* 1841, *inclusive.*

To Charles Sneath, of Nottingham, lace manufacturer, for certain improvements in machinery for the making or manufacturing of stockings or other kinds of loop-work.—Sealed 1st October.

Thomas Young, of Queen-street, in the city of London, merchant, for improvements in lamps.—Sealed 18th October.

Thomas William Berger, of Upper Homerton, Hackney, in the county of Middlesex, Gent., for improvements in the manufacture of starch.—Sealed 18th October.

Louis Lachenal, of Tichfield-street, Soho, mechanic, and Antonie Vreyres, of Pall Mall, watch-maker, both in the county of Middlesex, for improvements in machinery for cutting corks. —Sealed 18th October.

List of Patents

Granted for SCOTLAND, subsequent to September 22*nd,* 1841.

To Thomas Gore, of Manchester, machine-maker, for certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, silk, wool, and other fibrous materials.— Sealed 24th September.

Thomas Warren, of Montague-terrace, Mile End road, London, for an improved machine for making screws.—Sealed 30th September.

George England, of Westbury, clothier, for improvements in weaving woollens and other fabrics; and for twisting, spooling, and warping woollen and other fabrics; also for improvements in the manufacture of woollen doe-skins.—Sealed 30th September.

William Church, of Birmingham, for certain improvements in hooks and eyes; and in machinery for manufacturing the same. —Sealed 4th October.

Joseph Miller, of Monastry Cottage, East India road, London, for an improved arrangement and combination of certain parts of steam-engines, used for steam navigation.—Sealed 8th October.

John Varley, of 3, Bayswater-terrace, Bayswater, artist, for an improvement in carriages.—Sealed 11th October.

John Barwise, of Saint Martin's-lane, London, chronometer-maker, and Alexander Bain, of Wigmore-street, London, mechanist, for improvements in the application of moving power to clocks and time-pieces.—Sealed 15th October.

William Craig, engineer, Robert Jarvie, rope-maker, and James Jarvie, rope-maker, all of Glasgow, for certain improvements in machinery for preparing and spinning hemp, flax, wool, and other fibrous materials.—Sealed 19th October.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for certain improvements in the manufacture of fuel,—being a foreign communication.—Sealed 19th October.

Floride Heindryckx, of Fenchurch-street, engineer, for certain improvements in the construction and arrangement of fire-places and furnaces, applicable to various useful purposes.—Sealed 20th October.

New Patents

SEALED IN ENGLAND.

1841.

To Jean Louis Alphonse Petigars, of Brewer-street, Golden-square, Gent., for improvements in the construction of presses, —being a communication.—Sealed 24th September—6 months for inrolment.

Hugh Lee Pattinson, of Bensham Grove, Gateshead, Durham, manufacturing chemist, for improvements in the manufacture of white lead, part of which improvements are applicable to the manufacture of magnesia and its salts.—Sealed 24th September—6 months for inrolment.

Frederick Brown, of Luton, Bedfordshire, ironmonger, for improvements in stoves or fire-places.—Sealed 24th September —6 months for inrolment.

Theodore Frederick Strong, of Goswell-road, engineer, for certain improvements in locks and latches.—Sealed 28th September —6 months for inrolment.

Samuel Stocker, of Barford-street, Islington, engineer, and George Stocker, of Birmingham, cock-founder, for improvements in machinery and apparatus for raising, forcing, conveying, and drawing off liquids.—Sealed 28th September—6 months for inrolment.

John White, of Burton-in-the-Wolds, Leicestershire, farmer, for an improved horse hoe, for use in agricultural pursuits.—Sealed 29th September—4 months for inrolment.

Joseph Miller, of Monastery Cottage, East India Road, engineer, for an improved arrangement and combination of certain parts of steam-engines, used for steam navigation.—Sealed 29th September—6 months for inrolment.

Edward Welch, of Liverpool, architect, for certain improvements in the construction of bricks.—Sealed 30th September—6 months for inrolment.

William Hirst and Joseph Weight, of Leeds, in the county of York, clothiers, for certain improvements in the machinery for manufacturing woollen cloth, and cloth made from wool and other materials.—Sealed 7th October—6 months for inrolment.

Thomas Wells Ingram, of Birmingham, manufacturer, for improvements in shears, and other apparatus for cutting, cropping, and shearing certain substances,—parts of which said invention being a communication from a foreigner, residing abroad.—Sealed 7th October—6 months for inrolment.

Joseph Clisild Daniell, of Tiverton Mills, Bath, for improvements in the manufacture of manure, or a composition to be used on land as a manure.—Sealed 7th October—6 months for inrolment.

Matthias Nicolas La Roche Barré, of St. Martin's-lane, Middlesex, manufacturer of cotton, for an improvement in the manufacture of a fabric, applicable to sails and other purposes.—Sealed 7th October—6 months for inrolment.

Marcus Davis, of New Bond-street, optician, for improvements in the means of ascertaining the distances vehicles travel.—Sealed 7th October—6 months for inrolment.

Thomas Biggs, of Leicester, merchant, for improvements in securing hats, caps, and bonnets, from being lost by the effects of wind or other causes.—Sealed 7th October—6 months for inrolment.

Benjamin Aingworth, of Birmingham, Gent., for improvements in the manufacture of buttons.—Sealed 7th October—6 months for inrolment.

John Jones, of Smethwich, Birmingham, engineer, for certain improvements in steam-engines, and in the modes or methods of obtaining power from the use of steam.—Sealed 7th October—6 months for inrolment.

John Harwood, of Great Portland-street, Gent., for an improved means of giving expansion to the chest.—Sealed 7th October—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in engines to be worked by gas, vapour, or steam,—being a communication.—Sealed 14th October—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Gent., for improvements in firearms,—being a communication.—Sealed 14th October—6 months for inrolment.

Edward Massey, of King-street, Clerkenwell, watchmaker, for improvements in watches.—Sealed 14th October—6 months for inrolment.

Henry Ross, of Leicester, worsted manufacturer, for improve-

ments in combing and drawing wool, and certain descriptions of hair.—Sealed 15th October—6 months for inrolment.

Junius Smith, of Fen-court, Fenchurch-street, Gent., for improvements in machinery for manufacturing cloths of wool and other fibrous substances,—being a communication.—Sealed 20th October—6 months for inrolment.

John Bradford Furnival, of Street-Ashton, farmer, for improvements in evaporating fluids, applicable to the manufacture of salt, and to other purposes where evaporation of fluids is required.—Sealed 20th October—6 months for inrolment.

Henry Davies, of Birmingham, engineer, for certain improved tools or apparatuses for cutting or shaping metals and other substances.—Sealed 21st October—6 months for inrolment.

Thomas Jones, of Varteg Forge, near Pontypool, Monmouthshire, engineer, for improvements in the construction and arrangement of certain parts of marine and stationary steam-engines.—Sealed 21st October—6 months for inrolment.

James Whitworth, of Bury, in the county of Lancaster, manufacturer, and Hugh Booth, of the same place, machine maker, for certain improvements in looms for weaving—Sealed 21st October—6 months for inrolment.

Martyn John Roberts, of Brynycaeran, Carmarthenshire, Gent., and William Brown, of Glasgow, merchant, for improvements in the process of dyeing various matters, whether the raw material of wool, silk, flax, hemp, cotton, or other similar fibrous substances; or the same substances in any stage of manufacture; and in the preparation of pigments or painters' colours.—Sealed 26th October—6 months for inrolment.

Thomas Holcroft, of Nassau-street, Middlesex, Gent., for an improved portable safety boat or pontoon.—Sealed 28th October—6 months for inrolment.

CELESTIAL PHENOMENA FOR NOVEMBER, 1841.

D.	H.	M.	
1			Clock after the sun 16m. 17s.
	—		☽ rises 5h. 23m. A.
	—		☽ passes mer. 1h. 13m. M.
	—		☽ sets 9h. 57m. M.
	21		♂ greatest Hel. Lat. S.
2			Occul 139 Tauri im. 8h. 18m. em. 8h. 51m.
4	5		☽ in Perigee.
5			Clock after the sun 16m. 15s.
	—		☽ rises 10h. 22m. A.
	—		☽ passes mer. 5h. 12m. M.
	—		☽ sets 1h. 9m. A.
	15	19	☿ stationary.
6	4	14	☽ in □ or last quarter.
10			Clock after the sun, 15m. 54s.
	—		☽ rises 3h. 53m. M.
	—		☽ passes mer. 9h. 21m. M.
	—		☽ sets 2h. 34m. A.
	17	53	♀ in conj. with the ☽ diff. of dec. 7. 11. N.
12	12	52	♀ greatest Hel. Lat. N.
13	5	30	Ecliptic conj. or ● new moon.
13	8	3	☿ in conj. with the ☽ diff. of dec. 4. 7. N.
14	19	54	☿ in the ascending node
15			Clock after the sun, 15m. 12s.
	—		☽ rises 10h. 12m. M.
	—		☽ passes mer. 1h. 41m. A.
	—		☽ sets 5h. 10m. A.
	6	3	♃ in conj. with the ☽ diff. of dec. 3. 25. N.
	21	18	♄ in conj. with the ☽ diff. of dec. 3. 21. N.
16			Mercury R.A. 15h. 27m. dec. 18. 27. S.
	—		Venus R. A. 13h. 46m. dec. 9. 12. S.
	—		Mars R. A. 19h. 30m. dec. 23. 23. S.
	—		Vesta R. A. 1h. 39m. dec. 0. 40. S.
	—		Juno R. A. 14h. 43m. dec. 8. 10. S.
	—		Pallas R. A. 22h. 19m. dec. 9. 39. S.
	—		Ceres R. A. 1h. 8m. dec. 5. 42. S.

D.	H.	M.	
	—		Jupiter R. A. 17h. 30m. dec. 23. 4. S.
	—		Saturn R. A. 18h. 3m. dec. 22. 44. S.
	—		Georg. R. A. 23h. 26m. dec. 4. 28. S.
	—		Mercury passes mer. 23h. 37m.
	—		Venus passes mer. 22h. 5m.
	—		Mars passes mer. 3h. 48m.
	—		Jupiter passes mer. 1h. 47m.
	—		Saturn passes mer. 2h. 21m.
	—		Georg. passes mer. 7h. 43m.
	2		☿ in Inf. conj. with the sun.
17	15	14	♂ in conj. with the ☽ diff. of dec. 0. 38. S.
	—		Occul x3 Sagittarii, im. 6h. 26m. em. 7h. 35m.
19	7		☽ in Apogee.
19	9	22	☿ in Perihelion
20			Clock after the sun, 14m. 9s.
	—		☽ rises, 0h. 42m. A.
	—		☽ passes mer. 5h. 39m. A.
	—		☽ sets 10h. 47m. A.
21	6	11	☽ in □ or first quarter.
22	17	17	Her. in conj. with ☽ diff. of dec. 5. 8. S.
23	18	47	Pallas in the descending node.
25			Clock after the sun, 12m. 46s.
	—		☽ rises 1h. 51m. A.
	—		☽ passes mer. 9h. 12m. A.
	—		☽ sets 3h. 33m. M.
	—		Occul 101 Piscium, im. 6h. 26m. em. 7h. 36m.
	6	28	☿ stationary
	7	18	♂ in Perihelion
26	3	7	Pallas in □ with the ☉
27			Occul *b* in Pleiadum, im. 15h. 49m. em. 16h. 43m.
	—		Occul *d* in Pleiadum, im. 16h. 24m. em. 17h. 17m.
	—		Occul *n* in Tauri, im. 16h. 53m. em. 17h. 46m.
	—		Occul *h* Pleiadum, im. 17h. 32m. em. 18h. 23m.
28	6	38	Ecliptic oppo. or ○ full moon.
29	17	28	☿ greatest Hel. Lat. N.
	—		Occul 139 Tauri, im. 18h. 23m.
	18	19	Her. stationary

The Eclipses of Jupiter's Satellites are not visible at Greenwich this Month; and from the 26th day until the 18th day of January, the Satellites are not visible, Jupiter being too near the Sun.

J. LEWTHWAITE, Rotherhithe.

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No. CXX.

Recent Patents.

To THOMAS YATES, *of Bolton-le-Moors, in the county of Lancaster, munufacturer, for certain improvements in the construction of looms for weaving; and also the application of the same, in order to produce certain descriptions of goods or fabrics, by steam or other power.*—[Sealed 7th November, 1839.]

THESE improvements in the construction of looms, for weaving, and also the application of the same, in order to produce certain descriptions of goods or fabrics, by steam or other power, consist in a novel and peculiar arrangement of mechanism or apparatus, in combination with the various essential working parts of the ordinary power loom.

For the purpose, firstly, of effecting with greater facility a variety of shedding in the warps, in connection with the healds, or shafts, and working various descriptions of cloth or fabric, by means of a peculiar arrangement of revolving tappet plates, with bowls; and also a certain provision in

such tappet plates, whereby the pattern, style, or manufacture of the cloth or fabric to be woven, may be varied with the greatest readiness; secondly, in a novel and effective arrangement of mechanism, for the purpose of lifting and depressing the shuttle-boxes to or from the level of the shuttle-race, in the lathe, in those looms where two or more qualities, kinds, or colours of weft, are to be employed; thirdly, in a certain and effective mode of raising the "griff or grate" of the Jacquard machine, in all such looms where this apparatus is or may be employed; and fourthly, in a simple contrivance or arrangement of mechanism, for the purpose of throwing the loom out of gear with the driving power, either when the weft thread breaks, or is not "put in," or when the "taking up" of the cloth upon the work-beam is not equal to its production; such new motion being governed by the ordinary beat or vibration of the lathe.

In Plate XIII., fig. 1, represents a front elevation of the improved power loom; fig. 2, is a side elevation, taken at the right-hand side of fig. 1; and fig. 3, is a vertical section, taken through about the middle of the loom.

The ordinary framing or standards of the loom are shewn at *a, a, a,* supporting the several warp rollers *b, b, b,* from whence the warp threads proceed through the heddles or healds *c, c*; also through the reed *d,* of the vibrating lathe *e,* over the breast-beam *f,* to the cloth or work-roller *g,* as usual. This loom is also provided with an additional framing *h, h,* for the purpose of supporting the ordinary Jacquard machine or apparatus *i, i,* with its pattern-cords *j, j,* hooked wires *k, k,* and its lifting griff or grate *l, l.* There are also provided two shuttle-boxes *m, m,* which have to be raised and lowered to the level of the shuttle-race of the vibrating lathe, as occasion may require; and also peculiarly constructed tappet plates or wheels *n, n,* for the pur-

pose of performing the requisite working of the weft and warp threads, in weaving or producing certain fabrics, by steam or other power, as hereinafter described.

The power is to be applied to the driving pulley *c*, by the strap *p*, and thus, by means of the crank-shaft *q*, cause the vibrating lathe to beat up the cloth; and also, by means of the pinion *r*, and wheel *s*, upon the tappet-shaft *t*, cause the tappets *u*, *u*, to revolve, and thus to perform the alternate action of the prickers *v*, *v*, as in ordinary power looms.

There is also upon the reverse end of the crank-shaft *q*, a smaller pinion *w*, taking into the spur-wheel *x*, fastened by means of bolts *y*, *y*, *y*, to the tappet plates or wheels *n*, *n*, carrying their respective bowls 1, 1, 1, (shewn by the dots in fig. 2,) which act upon the inclined treadle plates 2, 2, 2. The treadle levers 3, 3, are connected by the stringing to the heddles or healds *c*, *c*, and are all mounted, side by side, each upon a separate axis, but formed as tubes, and placed one within another, to save room, as at *z*.—This arrangement of mechanism is peculiar to the first part of the improvements in the construction of looms; and it will be perceived, that the tappet plates or wheels *n*, *n*, *n*, are provided with concentric slots or mortices 4, 4, in which the studs of the bowls 1, 1, are fixed by nuts; and it will be very readily understood by any practical weaver, that by loosening the nut or nuts, and shifting the bowl or bowls, or set of bowls 1, in the concentric mortices 4, a great variety of shifts, numbers, or changes "to the round" may be thus simply and readily accomplished in patterns or figures, weaving without the Jacquard machine; and also the description of cloth or fabric may be easily varied in plain weaving, or in weaving grounds or "quiltings," in combination with the figures produced by or with the Jac-

quard machine,—such as a single or double cloth, satin, twill, plain or stitched faces, called quiltings, &c.

The second part of the improvements, namely, the peculiar arrangement of machinery for lifting and depressing the shuttle-boxes to or from the level of the shuttle-race, in the lathe, may now be particularly described:—Supposing the tappet bowls, just described, to be adjusted to weave a plain double cloth, with the employment of two shuttle-boxes, commonly called a three-pick lash, or a figured cloth, woven in different colours, and having a stitched or quilted surface,—the upper shuttle in the upper shuttle-box *m*, containing the fine weft, is now just lifted up, as seen in the drawing, by means of a concentric tappet plate 6, 6, fastened by bolts to the side of the outer tappet plate *n*, *n*, as it revolves, acting upon the bowl or roller 7, in the carrier 8, attached to one end of the levers 9, 9, upon the cross shaft 10. To the other end of these levers 9, are attached vertical rods 11, 11, adjustable by a screw in the middle, which enter at the bottom of the shuttle-race in the lathe, and thus project the shuttle-boxes, with the shuttles, upwards; and the upper shuttle is thus kept up out of the shuttle-race, as long as the concentric tappet plate 6, is acting upon the bowl 7;—that is, long enough for the lower shuttle, containing course weft, to put in one pick or shute of weft, prior to the Jacquard shedding, and one return shute of the same weft after the Jacquard shedding, when the bowl 7, will immediately ascend, and allow the shuttle-boxes *m*, *m*, to descend by their own gravity; and thus the upper shuttle is enabled to put in two shutes or picks of fine or coloured weft, before the Jacquard machine comes again into operation; and also two shutes of fine or coloured weft, prior to the next ascent of the shuttle-boxes.

The third feature of the improvements now comes into

operation, in order to complete the weaving, or put in the quilting, or stitching threads, by shedding the coloured warps b^1, and b^2;—this is accomplished by an improved method of lifting and lowering the griff or grate of the ordinary Jacquard machine, in order to insure a perfect regularity and steadiness of action in moving either upwards or downwards. For this purpose, a spur-wheel 12, 12, is attached, to drive the small pinion 13, keyed upon the shaft 14; and upon the reverse end of this shaft 14, a pair of segments 15, 15, having bevelled teeth formed upon one-sixth part of their circumference only, each driving, successively, the pinion 16, upon the small cross shaft 17; that is, these segments of teeth are so arranged, that as soon as the one segment of teeth 15, has turned the pinion 16, one-half of a revolution in one direction, the other segment of teeth instantly turns the pinion 16, one-half of a revolution in the reverse direction. In order to transfer this reversing motion to the raising and lowering motion of the griff or grate of the Jacquard machine, there is a bevel-wheel 18, upon the other end of the small shaft 17, taking into a pinion 19, of half its diameter, at the lower end of the vertical shaft 20, 20, which has, at its upper end, a cross head-piece 22, 22, having side grooved pieces 23, 23, in which the pins 24, 24, fast upon the head of the double screw 25, 25, work, and thus turn the double screw round. This double screw 25, 25, is cut for half its length in reverse directions, and runs in the nut 26, which will have the effect of lifting the griff or grate through the required space, in half the time the gearing would otherwise do, and thus save one-half the running speed of the ordinary working parts of the loom, and consequently produce a given quantity of work with half the wear and tear.

The fourth part of these improvements in the construction of looms, consists in a simple arrangement of mecha-

nism, designed for the purpose of throwing the loom out of gear with the driving power, either when the weft breaks or is not put in, or when the weft on the bobbin is expended, or when the taking up of the cloth is not equal to its production. This is accomplished by the ordinary beat or vibration of the lathe itself, and not at all dependant upon the coarseness or fineness of the weft thread.

A stud 27, in the sword of the lathe, usually employed for working the taking-up motion 28, operates upon a small lever 29, to which is attached the click 30, pulling round the ratchet-wheel 31, one tooth at every beat of the lathe. Upon this ratchet-wheel are four small pins 32, 32, (see detached fig. 4, drawn to a larger scale); this wheel runs loosely upon a small stud 33; which stud also carries a smaller ratchet-wheel 34, keyed fast upon it, and having four small holes in its side, corresponding with the pins in the ratchet 31; this stud 33, also carries, at its outer extremity, a small pinion 35, drawn by the spur-wheel 38, upon the shaft of the taking-up wheel 28.

Thus it will be evident, to persons conversant with such machinery, that as the lathe vibrates and beats up the cloth; and as long as the weft thread is put in, and the cloth sufficiently beaten up, the taking-up motion 28, will cause the pinion 35, to drive the stud and ratchet round; but, in the event of the weft not entering the cloth, and the cloth thus not being produced, the lathe will not advance sufficiently to beat up, as in ordinary power looms; but will advance sufficiently to drive the click 30, and ratchet 31; which wheel will now overtake the smaller ratchet; and as they are always held together by a spring behind the pins 32, will immediately enter the holes in the ratchet-wheel 34, and thus vibrate the rod 39, which slides the horizontal bar 40, before the strap spring-lever 41, and thus throw the strap from off the driving pulley.

The horizontal sliding bar 40, now returns by means of the side motion of the setting off lever 41, and thus releases the pins from the holes. In the two small ratchet-wheels there is a catch-piece 42, upon the rod 39; this catch-piece, as it returns, pushes the click-lever 43, and click 44, onwards, and just advances the smaller ratchet-wheel one tooth, in order to set the holes free of the pins, and thus be ready to start the loom again.

Fig. 5, represents a detached and enlarged view of one of the tappet plates, with its tappet or bowl, moveable in the concentric mortices; and fig. 6, represents a modification of the improved mode of lifting the shuttle-boxes, and is here shewn as capable of lifting and sustaining six boxes, by means of the plates, bowls, and rack.

It will be obvious to any practical weaver, that this may be varied and adjusted to suit a greater or less number of boxes, as circumstances may require, by adding or diminishing the number of plates and bowls, and arranging the same.

The patentee claims the whole of the several improvements herein particularly described and shewn in the drawings, whether used separately or in combination.—[*Inrolled at the Rolls Chapel Office, May,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To William Henry Hornby, *and* William Kenworthy, *both of Blackburn, in the county of Lancaster, manufacturers, for certain improvements in the machinery or apparatus for sizeing or otherwise preparing cotton, wool, flax, and other warps for weaving.*—[Sealed 26th September, 1839.]

These improvements in the machinery or apparatus for sizeing and otherwise preparing cotton, wool, flax, and

other warps for weaving, consist in a novel and particular arrangement of mechanism for sizeing and preparing warps from "beam or machine warping."

The principal feature of novelty and improvement in such operations, is the peculiar mode of distributing or laying out of the warp threads, so that they shall be dressed or sized in parallel strips or breadths, laid in even and close contact, side by side, and usually termed "beers or half beers," in the ordinary warping mill.

This new method of dividing and laying out the warp threads into strip bands, or beers and half beers, during the process of sizeing and preparing them for the loom, possesses many advantages, which will be evident to persons conversant with the ordinary method of conducting such operations.

As the threads are divided into certain numbers, forming a beer or half beer, and in that breadth passed through the sough or sizeing material, they retain the form of bands or strips, and are slightly attached to each other by the adhesion of the size, thus forming narrow tapes or breadths of warp threads, and consequently rendering them more tenacious than if passed through the sizeing and preparing process in single threads, as commonly done, and allowing them to be more easily conducted through the machinery. The warps may be thus extended to a much greater length than usual, and the process of taking the "lease," and winding on to the warp-beam ready for "looming," can be effected, by the arrangement of one and the same machine, with more expedition than under the ordinary method now in use.

One of the improvements connected with the working of the machinery, is a new arrangement of the healds for obtaining the lease or cross shed of the warps, previously to the dressing, sizeing, or drying of the same; that is,

placing the healds, for dividing the shed of the warps, at the entrance end of the machine, or at the commencement of the operation; and the further improvements in the machinery for sizeing and preparing warps, consist in a novel form of "wreath" or comb-bar, for allowing the lease band or cross band to pass through the warps without the necessity of having the whole of the half beers or breadths to be re-laid at each time of taking such lease or cross shed; and also in the application of a revolving self-acting marker, for marking off any required length of warps, as they are wound on to the warp-beam, ready for looming.

In Plate XIII., fig. 1, represents a plan or horizontal view of the machinery, in which these improvements are shewn; fig. 2, is a side elevation; and fig. 3, a vertical section of the same, taken longitudinally through the middle of the machine. The main and side framings of the machinery are shewn at *a, a, a, a,* which support the beams of warp or yarn *b, b, b, b,* previously wound and prepared by the warping machine. These main side frames also support the various wreaths or comb-bars, healds, soughing, sizeing, or dressing troughs or boxes; the drying cylinders, tension and guide rollers, and also the driving apparatus for giving motion to the mechanism.

It will be perceived, that as the unsized warps proceed from their respective beams *b, b, b, b,* they are guided on to and passed through an ordinary comb-bar *c, c,* and thus divided equally, prior to their being passed through the healds *d, d,* situated at the entrance of the machine, for the purpose of effecting the cross shed, and thereby taking the lease previously to the yarns being submitted to the sizeing process. The lease now being taken, and the cross band or threads introduced, for the purpose of looming or drawing in of the weaver's beam, as is well understood, the yarns or warps are passed over a wreath or comb-bar *e,*

formed by a rack of teeth or pins and intervening spaces, for the purpose of dividing and laying the warps in parallel breadths, side by side, and forming each division, strip, or band of warps (of any required number) into separate and distinct tapes or sheets, (of any desired width,) each thread being laid parallel, side by side; and thus, in close lateral contact, the wreath or comb-bar *e*, either being allowed to vibrate or oscillate freely as the warps proceed over it; or it may be caused to revolve, if found more desirable.

The continuous warps now being thus made or separated into breadths or bands A, are now passed over a conducting roller, and immersed into the trough or vessel *f*, which contains the sough or sizeing material, which is here to be kept in a heated state, by steam passing through the pipe *g*, or otherwise, and thus boiled into the warps as they pass through it, and under the tension rollers *h*, *h*. It will be observed, that these rollers *h*, *h*, may be adjusted to any degree of tension, or raised up entirely out of the troughs to be cleaned or otherwise, by turning the winch-handle 11; which, by means of the worms and wheels 12, 12, and pinions 13, 13, take into the racks 14, 14, in connection with which the pivots of the rollers *h*, *h*, are mounted. The warps are then to be passed forwards through a pair of squeezing rollers *i*, *i*, and again similarly immersed in the trough or vessel *j*, *j*, containing a similar sough or sizeing preparation, to finish the yarns; from thence they are passed around the drying cylinder *k*, *k*, also heated by steam through the pipe *g*, and discharged by the pipes *l*, or by any other convenient means. The yarn or warps, as they pass around these drying cylinders, will now be found to assume the form of tapes or bands, as the sizeing material will cause the parallel threads, as they lay side by side, to adhere slightly together, and thus proceed in a tape-like form, being of course much stronger, more regular and

even, and less likely to be broken or disarranged, than in the ordinary mode of sizeing.

A brush 15, is placed over the yarns as they proceed over the cylinder *k*, for the purpose of dressing and laying the fibres of the threads, and making the tapes or bands more compact and even. It is caused to revolv every slowly, by means of the small band 16, proceeding upon the pivot of the guide roller *m*. The warps now proceed in a sized, dried, and finished state, conducted by the rollers *m, m*, through a similar wreath or comb-bar *n, n*, but of a much finer rake or pitch than the wreath *e, e*; and by passing through or over which, the strips or bands are turned edgewise, and again similarly divided by the oscillating or vibratory action of this comb-bar *n, n*, and laid over the tension roller *o, o*, in a proper state to be received and wound upon the warp-beam *p, p*, ready to be removed and taken to the loomer or drawer in.

The continuous operation of the machinery is effected by means of a strap passing around the driving pulley *q*, upon the end of the transverse shaft *r*, being traversed from the loose pulley by the setting-on rod *s, s*. Upon the shaft is also a conical drum *t*, having a driving strap passing around it, and the corresponding cone *u*, mounted also upon a transverse shaft *v*; at one end of which there is a toothed pinion *w*, driving the train of spur-wheels *x, y, z*, which gives rotary motion to the warp-beam *p, p*, causing it to wind on the yarn or warps, as required. The yarn is kept distended and even, by means of weighted friction bands *l, l*, being passed around the ends of the warp-beams *b, b*, and the pressure of the squeezers or presser roller, is similarly adjusted, by means of the weighted lever 2.

The self-acting marking apparatus is also shewn in these figures. Upon the end of the revolving guide roller *o, o*, is a small worm 3, taking into a worm-wheel upon the end

of the shaft 4; at the reverse end of which is the mitre-wheel 5, driving a corresponding wheel 6, upon the small shaft 7, which carries at the other end the revolving marker 8, alternately dipping into a colour-box 9, and marking the warp threads with a patch of colour as it revolves; thus marking any length of warp for the pieces intended to be woven, and allowing the warp-beams to contain accurate lengths without waste in the looming.

In the detached figures 4, 5, and 6, are shewn three varieties of the improved wreath or comb-bar, (upon a larger scale,) for dividing or separating the warps, as they pass through the machine.

Fig. 4, shews one description,—being that preferred to be used with a pendulous or oscillating motion.

Fig. 5, another, which is preferred to be used as a rotary comb-bar; and it will be perceived, that one set or rake of teeth will always be entering and dividing the warps, as those on the opposite side leave them.

Fig. 6, shews another modification of the same, which may either be used with a rotary or any other required motion.

The patentees claim the novel arrangement and construction of the mechanism for performing such or similar operations or processes as are represented in the drawings attached and herein set forth; most particularly and distinctly, the dividing or forming the warps into strips, bands, breadths, or tapes; or even combining the whole, side by side, in a single broad sheet, if desired; or in divisions, consisting of any number of threads, and retaining them in such combinations during the operation of sizeing, drying, and preparing warps for weaving; also the novel arrangement or situation of the healds in the machinery, for obtaining the cross shed of the whole warps, in taking the lease, previously to dressing, sizeing, and preparing the

same; also the new forms of wreath or comb-bar, as described, being open at the top, and thus allowing the cross or "less bands" to pass them; and lastly, the application of the self-acting revolving marker, for marking the warps in any required length.—[*Inrolled at the Rolls Chapel Office, March,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To JOSEPH CHESBOROUGH DYER, *of Manchester, in the county of Lancaster, machine-maker, and* JAMES SMITH, *of Deanstone, in the county of Perth, in North Britain, cotton-spinner, for their invention of certain improvements in machinery, used for winding upon spools, bobbins, or barrels, slivers or rovings of cotton, wool, and other fibrous substances of the like nature.*—[Sealed July 17th, 1835.]

THIS invention is described by the patentees, as consisting in an improved mode of winding slivers or rovings upon spools, bobbins, or barrels, as they proceed from the delivering rollers of carding engines, drawing frames, or other similar machinery; and, they further say, "by this our invention, the slivers or rovings are disposed on the spools, bobbins, or barrels, in a conical form, and in successive spiral layers, thereby affording the means of extending the mass of slivers or rovings, which can be wound on an individual spool, bobbin, or barrel, to any convenient or useful extent, whilst it gives greater facility to the unwinding of the slivers or rovings, as they go to supply any succeeding process; the slivers or rovings unwinding as yarn does from a cop, without the necessary rotation of the general mass, the saving of labour, of attendance, and of waste, together with other advantages, arising from this our

invention, will be at once obvious to all persons conversant with the manufacture of cotton, wool, flax, silk, or other fibrous substances, into continuous lines or threads."

The patentees then proceed to describe the arrangement and mechanism whereby they accomplish the application of their invention to old machinery, whereon the sliver or roving has been formerly wound or compacted by the usual method, or to new machinery, constructed purposely to suit the invention.

The invention is particularly applicable to the sort of roving frames, usually called the tube frame, and for which, a patent was granted to the above-named Joseph Chesborough Dyer; the present patentees, therefore, describe the mechanism and arrangement, whereby the application of their invention to that description of machinery is accomplished, and which description will sufficiently illustrate its application to any of the other machines for this purpose. "The spools or barrels may be made of wood, paper, tin, sheet iron, or any other suitable material. In the drawing accompanying the specification, they are shewn as made of sheet iron, and the stem of the spool or barrel, is one inch in diameter, and the bottom part is extended to five inches in diameter, having a conical base piece on which the first layer of rovings is wound.

The winding of the rovings in a spiral form, is accomplished by progressive and proportional movements of the twisting tubes, and also of the barrels or spools. The tubes are fitted in holders attached by bolts to projecting brackets, springing from a rail which runs along the frame in front. In the end pieces of this frame are grooves, which fit on to feathers attached to the frame-work of the machine, which admits of a movement of the rail in a direct line parallel to the oblique line of the conical surface, on which the rovings are being wound. The pro-

gressive motion of the bobbin or spool, for the purpose of winding the yarn in a spiral and conical direction, is effected by a toothed wheel or pinion, which gears into a rack attached to the rail on which the bobbins or spools are mounted, and which causes the said bobbins to rise and fall before the twisting tubes."

In conclusion, the patentees say, "we do not claim, as any part of our invention, any part or parts of the said machine or machines, to which our said invention is applied, and which have been in use heretofore, nor do we claim, as our invention, any part by itself of the mechanism which we have found it convenient to use for the purpose of rendering the principle of our said invention effective; but we do claim the peculiar arrangement of the mechanism, and we do especially claim the principle and mode or modes of winding slivers or rovings of cotton, wool, flax, silk, and other fibrous substances, proceeding from the delivering rollers of carding engines, drawing frames, slubbing frames, roving frames, or other the like machinery, now in use, or that may be invented or used, during the existence of our said patent, upon spools, bobbins, or barrels, in successive spiral layers, and specially shewn and described in this our specification.—[*Inrolled in the Inrolment Office, January*, 1836.]

To JAMES ROBERTS, *of Sheffield, merchant, for an improved mode of fastening certain kinds of horn and hoof handles to the instruments requiring the same.*—[Sealed June 3rd, 1840.]

THIS invention is described by the patentee in the following manner:—

"The kinds of horn or hoof handles above alluded to, are

such as are made from horns or hoofs of animals, and which are capable of being softened so as to receive the necessary impression, hereafter described; and the instruments here alluded to, are knives and forks; and the nature of my said invention, consists, in fastening the said handles to knives and forks, by pressing the said handles on and into studs, projections, çavities, or indentations through, on, or into the tangs of the same, when the said handles are in a softened state, and thus causing them firmly to adhere to the said knives and forks."

Plate XIII., fig. 1, represents a back edge view of a knife that has been fastened into the handle, in the manner described by the patentee; and fig. 2, is a side view of the same. In these figures, the tang, or that part of the knife which is inserted into the handle, is shewn by dots; and it will be seen that the tang is indented or jagged on one side, so that when the horn in a soft state is pressed on to it, the blade can never be withdrawn from the handle, and never become loose.

Figs. 3, and 4, represent similar views of a fork, which is fixed in the handle, upon the same principle; but in a slightly different manner. In the latter the tang is made flatter, and is furnished with studs or projecting pieces, which answer the same as the indentation, as in the former instance.

In conclusion, the patentee says, "now, whereas, it is evident, that the particular kind of dovetail, stud, projection, or cavity, formed on, or in any way applied to the tang of the knife or fork, and over or round, or into which the soft scale or handle is pressed, may be varied at pleasure; what I claim as my invention, is the fastening of soft horn and hoof handles, whether in the form of scales or solid, to knives and forks, by pressing the said soft horn or hoof, over, round, or into projections or cavities formed

on or in, or in any way applied to the tang or any part answering the purpose of what is now called the tang of knives and forks; which mode of fastening horn and hoof handles to knives and forks is more durable than any plan heretofore adopted, and supersedes the use of resin; and thus, the said knives and forks are enabled to be washed in hot water without their handles coming off, or becoming loose.—[*Inrolled in the Inrolment Office, December,* 1840.]

To JOHN MAUGHAN, *of Connaught-terrace, Edgware-road, in the county of Middlesex, Gent., for certain improvements in the construction of carriages.*—[Sealed 24th September, 1840.]

THIS invention consists in the improved construction and mode of applying two pairs of shafts to that description of carriage generally denominated a "curricle," which are to be employed as a substitute for the pole and cross-bar, commonly applied to a carriage of that description; by which improved mode of attaching two horses to a curricle, much lighter construction of the vehicle is practicable, elegance of appearance increased, more freedom of action allowed the horses in their draught, and greater safety insured.

The lightness is owing to the removal of all the heavy carriage frame-work necessary in the old construction,—the shafts (which are light) connecting immediately by scroll-irons to the foot-board of the vehicle; greater elegance of appearance is consequent upon the absence of the aforesaid frame-work, and the usual pendant wooden support-horse; more freedom for the action of the horses results from getting rid of the friction of the iron bar across

their backs, by a transfer of its agency to a balance cross-spring under the body of the vehicle, attached to the shaft-tails, which admits of the balance-action of each pair of shafts at their resting points in the hook-tugs of each horse's harness, or in other words, admits of their alternating to the relative heights of the animals, whatever may be their inequality from size or position, whilst the horizontal action of each pair permits the animals to separate and approach each other freely, unrestrained by pole-pieces, as in the old way, but kept at their due distance from one another by the coupling reins alone, though a strong strap depends from collar to collar, as a precaution in case the coupling-reins should prove, from any accident, insufficient to restrain too wide a separation.

Greater safety arises from the carriage having a wide support in front instead of the single centre bearing afforded by the pole of the old curricle; which wider support renders a vehicle of any construction less liable to upset. The equal division of the support of the front weight between four shafts, offers moreover less risk of accident from breakage than when the weight is upon one pole only; and the danger from overbalancing backwards, in ascending hills, or from other circumstances, is also effectually obviated.

In Plate XIV., fig. 1, is a horizontal view of two pairs of shafts, in the situation they would occupy when attached to the carriage; but in the present figure they are represented as detached therefrom; fig. 2, is a side elevation of a carriage, with the improvements attached thereto; and fig. 3, is an elevation of the back of the carriage.

Each pair of shafts, attached to the carriage, are connected together and kept firm by an horizontal bar *a, a,* (see fig. 1.) The middle part of this bar is held by clips *b,* in which the bar turns as an axle; and the clips are connected to the body of the carriage by an upright pin *c,*

extending therefrom, and passed through a socket in the scroll or bracket-iron *d*, as represented at fig. 4. The bar *a*, is shewn detached, upon an enlarged scale, in a vertical position, at fig. 5, with the swing-tree mounted on the pin *c*, by means of an iron socket *e*, attached to the centre of the said swing-tree.

The shafts *f*, *f*, are constructed of ash, and ironed in the usual way throughout. The bars *a*, *a*, are attached to the shafts *f*, *f*, by clips *g*, *g*, at their extremities, as shewn; and the back parts of the shafts are bent inward or "compassed," and terminate in sockets *h*, having a bolt-eye *i*, at their united extremity, as shewn at fig. 1.

Under the seat of the body of the vehicle, a horizontal balance-spring *k*, is placed transversely, mounted upon a strong stud or short axle *l*, affixed to the framing of the body; the outer end of which axle is supported by a pendant bolt *l**. A loop or bored coupling *m*, connects the spring *k*, to the stud or axle, and allows it to vibrate and advance and recede thereon. From the ends of this spring *k*, two rods *n*, *n*, are pendant, for the purpose of connecting the spring to the ends of the shafts at *i*, *i*. Both ends of these rods *n*, *n*, have shackle joints, as shewn in the drawings.

The effect of this mode of adapting shafts to a curricle, is as follows:—Let it be supposed, that two horses are attached to the carriage, the belly-bands of the harness being passed round the shafts at the tugs, and the ends of the traces hooked on to the extremities of the swing-trees, in the ordinary way, it will be seen, from the manner in which both the pairs of shafts are connected to the balance-spring *k*, and the peculiar method of attaching the shafts to the carriage by the joints formed by the clips *g*, *g*, and upright pin *c*, that the action of one horse, however different from that of the other, will not incommode its companion, or communicate any unpleasant motion to the car-

riage. As the bars *a, a,* of the shafts, turn vertically in the clips *g, g,* and the upright pin *c,* of the said clips turns horizontally in the socket of the scroll-iron, a sort of shackle joint is thereby produced, which admits of the desired balance and horizontal action of the shafts, provided for by the balance-spring *k,* and connecting rods *n, n.*

Fig. 9, represents sections of the two inside shafts, at the tugs, with a side view of the shields and cross-plate, applied to the sides of the shafts, as shewn also at *u,* and *y,* in fig. 1, for the purpose of preventing one shaft from catching under the other, when the horses are in motion, and approach each other. Gig harness, having iron hook-tugs, is to be used with the balance-shafts, and the inside shaft of each pair must be padded out laterally on wooden chocks, leaving a niche for the hook-tug. This padding is intended to support the covered and stuffed iron shields. The shield at *u,* fig. 1, is furnished in its concave centre with an iron loop or staple, similar to that on the point of the hook-tug. The continuation of the back-band passes through this staple first, and then through the loop of the hook-tug. The back-band thus attaches the shield to the hook-tug, as an appendage; and when the horse is "put to," it holds the shield firmly in its place on the padding, by being passed round the shaft in the usual way. The shield, as above described, is all that is requisite for the one shaft *u,* but the shield for the other shaft, at *y,* fig. 1, may be shorter, and must have an iron convex compassed plate, covered and stuffed, attached by a loose rivet across its centre.

Fig. 10, is a front view of this latter shield, with the covered compassed plate, which is furnished with holes at both ends for small straps, to confine it above to the back-band, and below to the belly-band. The convex face of the said upright compassed plate, it will be seen by fig. 9, takes at right angles with and on the convexity of the hori-

zontal shield on the opposite shaft, when the horses approach each other, thus preventing the shafts from obstructing each others action, and at the same time protecting the harness from getting chafed. This shorter shield and cross plate has its loop or staple, similar to the loop of the longer shield, and is attached to the hook-tug precisely in the same manner as the said longer shield of the opposite shaft, and is held firmly in its place on the padding, just in the same way.

The manner in which the horses are to be put to, that is, introduced between the shafts of the carriage, allows of an unquiet animal being harnessed in, without the danger usually attending that operation, when the curricle has a pole and cross-bar.

A vehicle of the old construction, depends for support upon the usual pendant prop or wooden horse, until the bar is placed across the back of *both* animals, and the slightest restiveness of either horse, whilst being attached, may cause the prop to be broken or displaced, to the almost certain injury of the carriage, and perhaps of horses likewise. In this improved construction of curricle, the danger is obviated in the following manner:—

A simple iron instrument, hereafter described, is to be slipped on one extremity of the balance-spring, before commencing to put to the horses.—This will have the effect of causing both pairs of shafts to rise from the ground together, and preserve their coincident level. On lifting one of the pairs, one of the horses is then to be introduced between the *lifted* pair, and harnessed thereto, precisely as in a common gig. The animal will thus at once, and alone, duly support the carriage; and if restive and uneasy, be free to move, without the risk of doing injury either to the vehicle or itself. The second pair of shafts can now be raised from the level of the first pair, at which they rested while the first horse was putting to, and the second animal

brought in to its place with perfect safety, the shafts dropped into the iron hook-tugs of the harness, and the putting to completed; when the loose iron being slipped off the balance-spring, the balance and horizontal action of the shafts will be restored.

The simple iron instrument, above referred to, of the form shewn in fig. 6, may be carried in the seat of the vehicle, or stowed away in any other convenient place. It is applied by its fork *x*, to one end of the balance spring, as shewn at figs. 7 and 8. The upper end of this instrument, by abutting against the frame-work of the seat, has the effect of preventing that end of the balance-spring, to which it is applied, from rising, but leaves the other end free to do so; by which it will be seen, that the lifted pairs of shafts must bring up off the ground the sustained pair, at a coincident level, and that the sustained pair are free to be raised from the coincident level to admit of the second horse being brought into its place. The lower end of this instrument has a fork formed in it at *x*; which fork, by embracing the lower end of the pendant rod *u*, prevents any horizontal action of the pair of shafts connected thereto. —[*Inrolled at the Rolls Chapel Office, January*, 1841.]

Specification drawn by Messrs. Newton and Berry.

To William Brockedon, *of Queen-square, in the county of Middlesex, Esq., for his invention of a combination of known materials, forming a substitute for corks and bungs.*—[Sealed 17th October, 1838.]

The materials intended to be employed by the patentee, as a substitute for corks and bungs, are felted or woven wool, rope, or other similar elastic fibrous materials; which,

when matted or felted together, are covered over with a coating of India-rubber. The wool may be felted or woven by hand, or by machinery, and made into a roll of any convenient length, and then cut into pieces of the size required; or a rope, formed of strands, may be employed, reduced to proper lengths for the purpose intended.

The proper sized pieces to form the stopper, and which should also be made slightly conical, are then covered with a solution of India-rubber, by means of a brush, or they may be immersed therein; but in the latter case, the absorbent nature of the materials would cause the stoppers to take up more of the solution than is required; it is, therefore, better to apply the solution by hand.

A portion of the India-rubber solution should then be spread out very thin upon a flat metal or glass plate, and the liquid portion evaporated; and when this has been effected, the India-rubber may be divided, by means of a wet knife, into pieces sufficiently large to cover the surface of the felted pieces or stoppers, which should be covered with the same; the solution, previously applied, serving to retain the sheet-rubber in its proper place. The ends of the stoppers are then served with the solution, and pieces of sheet-rubber, of the proper size and shape, being applied thereto, the lower edge of the sheet-rubber, which surrounds the stopper, is made, by pressure, to become attached to the end pieces just applied, and thus form an elastic and impermeable stopper for wines or other liquids.

A flat stopper, intended to cover the aperture of the bottle, is made by punching out a piece of felt of the required size, and then applying the caoutchouc, as in the former instance; and stoppers, of other shapes, may be made upon the same principle.

The patentee says, he is aware that India-rubber has

been used for stoppers for ink-stands, &c., before; but, in those cases, a considerable thickness of caoutchouc was employed, and being liable to become hard, did not answer the purpose; whereas, his improved stoppers, being formed of an elastic material, such as felt, &c., and covered with only a thin coating of India-rubber, are not liable to get hard; he therefore claims the combination of the materials, above named, with caoutchouc or India-rubber, for the purpose of making stoppers to bottles, &c.—[*Inrolled at the Inrolment Office, April,* 1839.]

To WILLIAM BROCKEDON, *of Queen-square, in the county of Middlesex, Esq., for his invention of improvements in the means of retaining fluids in bottles, decanters, and other vessels.*—[Sealed 31st January, 1840.]

IN describing his improvements, the patentee says:—"My invention consists in a mode of constructing and applying discs or capsules to the tops of stoppers, which enter or cover the mouths of bottles; and also when tied or wired on, in keeping them firm in their place, retaining them against the pressure from within the bottle.

"In order to preserve the greatest resistance, with the least thickness of the capsules or discs, they are dished or hollowed, and struck into their form in a die, by a fly-press or other convenient means.

"In order to fasten the disc upon the cork or stopper, I form, by means of the die or other apparatus, grooves across the disc or capsule, in which the wire lies extended, and thus presents wider and more secure points of bearing over the top of the bottle or vessel.

"In order to secure an equal pressure and contact of the flat stopper, composed according to my former patent of woven or felted wool, or fibrous elastic matter, faced with India-rubber, I adopt, among other forms, one very well suited to my purpose.—Instead of sinking grooves in the upper face of the disc or capsule, I raise bosses or ridges, which serve as guides to the wires or ties, to keep them apart and distribute their force of resistance, and securely hold the wire or string from slipping off the edge of the disc, in fixing the discs to the mouths of the bottles.

"In making such discs or capsules, I usually form them of iron, or iron tinned, but I do not confine myself thereto. Circular blanks being cut out of the sheet of iron or other metal, it is placed in a die of the desired form and size, and by means of a fly press or stamping press and dies, the required form is obtained."

Fig. 1, in Plate XIV., represents a circular piece of metal, with two grooves formed thereon, for the purpose of holding the wire or string, as above mentioned; fig. 2, represents another circular piece of metal, with bosses or projections, employed in place of the grooves of the former figure;—both these discs or capsules are slightly dished or hollowed in the middle, to make them stiffer; fig. 3, shews the neck of a bottle, with the former disc applied to it; and fig. 4, is a similar view, with the second disc or capsule tied on by wires or otherwise.

The patentee concludes by saying:—"I would remark, that I do not confine myself to the precise form of the discs or capsules, nor to the material of which they are desired to be made; and the discs or capsules may be made by other means than what I have described, without departing from my invention; and although I have shewn particular modes of stopping bottles by my patent stopper, and by ordinary corks, they form no part of my present patent,

except so far as the using therewith discs or capsules; but what I claim, is the mode of employing capsules or discs, as above described."—[*Inrolled in the Inrolment Office, July*, 1840.]

To Edouard François Joseph Duclos, *late of Samson, in the Kingdom of Belgium, but now of Church, in the county of Lancaster, Gent., for his invention of improvements in the manufacture of zinc, copper, tin, and antimony.*—[Sealed 31st May, 1838.]

In specifying this invention, the patentee has commenced by describing the ordinary process employed in the manufacture of zinc, copper, tin, and antimony, so as more clearly to point out his improvements; and he says,—"I will first remark, that when the ore to be operated upon, according to my invention, consists of minerals termed sulphurets, I convert those sulphurets of the metal into sulphates, by various modes of oxydation; and from the sulphates so obtained, I separate the metals from the sulphuric acid, either by bringing them into oxides, or by such other means as I shall point out, and from which I obtain the metallic product, by modes of reduction adapted to the peculiar properties of each metal. When the metals are mineralized by other substances, I convert them into oxides by modes already known."

In describing his improvements, the patentee says,—"I take any quantity of sulphuret of zinc, which is in small particles, in the state in which the ore is generally dressed at the mine. I mix with it hydrate of lime, (slack lime,) in a sufficient quantity to render it adhesive, the proportion being about two-fifths quick lime, of the weight of the

blonde or zinc ore, and mould the composition into blocks or bricks, the object being, by the addition of lime to the blonde, to separate the sulphur therefrom, and also to prevent the metallic zinc from combining with other foreign matters which may be contained in the ore. Having dried the bricks so made, I place them in an ordinary brick-kiln, where they are submitted to the action of a gradually increasing heat for twenty-four hours. When the bricks are in a state of redness, they are left in the kiln for forty-eight hours, without the communication of any additional heat, combustion being maintained for a portion of the time by the absorption of the oxygen of the external air, by the sulphur and metal contained in the blocks or bricks.

"After being removed from the kiln, they are broken into small pieces, and in that state placed in a reverberatory furnace, and submitted to calcination for from twelve to twenty-four hours,—carbonaceous matters, such as coal, being added thereto, in the proportion of from twelve to fifteen per cent. of the weight of the materials introduced.

"The coal or other carbonaceous matters are put into the furnace every four hours, in the proportion of one and a half per cent. of the weight of the material, with which it is intimately mixed or stirred. In the last two hours of the operation, a further addition is however made, so that the entire quantity of the coal or carbonaceous material used, is equal in the whole to from twelve to fifteen per cent. of the mixture of blonde and lime, subjected to calcination.

"The substances having been properly calcined, are then submitted to the action of a blast furnace, into which they are placed, for the purpose of separating zinc, in the form of vapours, from the other foreign matters contained in the calcined mixture."

The second part of the invention relates to the manu-

facture of copper from the ore. The patentee says:—"According to my invention, rich or poor ores may be treated without admixture, as is the common practice; and my first object is to extract a portion of the sulphur from the ore by distillation, in order to render the ore fit for the further process; taking care, in the process of distillation, to prevent atmospheric air from getting into the retorts or vessels containing the ore under operation, and in distilling, by heat, a portion of the sulphur will be driven off, leaving, however, a sufficient quantity combined with the mineral to convert it into sulphates. In order to effect this, I use an apparatus consisting of two retorts, into which the ore is introduced, the cover or plates being affixed to the mouth of the retorts; a pipe proceeds from the opposite end of the retort, enters the water contained in a trough, and is used for the purpose of conveying the vapour of sulphur into the trough. Coal is introduced into a chamber through a convenient opening, and the heat arising from the manufacture of coke is employed for heating the retort; the heat, so obtained, being well calculated for carrying on this part of the operation. The carbonaceous matters, which are evolved during the combustion of the coal, escape by an opening in the arch of the oven, and passing from thence into the flues, where they come into contact with the heated air, by which the combustion of them is effected, and escapes into the chimney.

"The heated air, for the above purpose, may be obtained by passing air through two or more retorts, and conveyed to the flues by pipes, in any convenient manner. The tops of the flues are covered with a series of cast-iron plates, on which rest leaden vats or troughs, into which the ore, after being submitted to the treatment in the retorts for from eight to twelve hours, is subsequently introduced in a hot state. These troughs are made tight by water joints,

and the ore is introduced therein, for the purpose of converting the sulphurets into sulphates, and is effected by adding a sufficient quantity of oxygen, in any convenient manner. I effect this object by introducing steam atmospheric air or nitrous gas.

"The sulphurets are separated from the undecomposed matters, by introducing water through a perforated pipe, in such a manner that the jets are directed into the materials contained in the vats or troughs, and by this means, the sulphurets are dissolved, and the solution drawn off into a leaden vessel for evaparation. This solution, when taken from the vat, is evaporated until it is in a state of concentration, holding in solution from twenty-five to thirty per cent. of salts. I then introduce pure iron in the state of crystallization, and, by its introduction, the copper is precipitated in its metallic state, and the sulphurets, remaining in solution, are then drawn off, and the precipitate is washed, until all the soluble salts are completely separated from it. The copper is then taken and submitted to fusion, taking care, by a proper flux, to prevent it from becoming oxidized or carburetted.

"In order to render my process applicable to water, impregnated with small quantities of copper only, and which may be raised or obtained from mines, I evaporate the water to that state of concentration which I have already described, and then proceed as above mentioned."

The third part of the invention relates to the manufacture of tin; and in describing his improvements, the patentee says:—"Tin is formed in combination with various matters and minerals, such as the sulphurets of different metals; and tin is also obtained from alluvial deposits, known by the name of 'stream tin,' or oxide of tin. The reduction of this metal from stream tin is effected by means of a blast furnace, in which heat is developed by

charcoal, the metal descending, in very nearly a pure state, to the bottom of the furnace. The only difference in my mode, is introducing with it charcoal or other carbonaceous matter into retorts. On sufficient heat being applied externally, the tin will run from the retorts, in consequence of a slight inclination which is given to them.

"My process for manufacturing tin, when sulphuret of iron is combined with it, is as follows:—I successively submit them to the same processes as those described in my improved mode of manufacturing copper, up to that point where I draw off the sulphates in solution. The tin and other materials which run into the troughs or vats, must be removed from them and submitted to levigation, which will carry off the earthy matters, the tin and woolfram remaining. I then introduce it, with charcoal or other carbonaceous matters, into retorts, and the metal is obtained from thence, as described in my mode of reducing stream tin.

"The fourth part of my invention relates to the treatment of antimony; and, according to my improvements, I subject it to the same processes of calcination, volatilization, and condensation, as that already described in my improved mode of manufacturing zinc. The oxide thus obtained, I mix with coal or other carbonaceous material, and subject it to heat in retorts, adding any of the subtances as a flux, (carbonate of soda or potash,) which are found to answer for reducing it into a metallic state. The metal is then taken from the retort and re-melted, as already practised."

In conclusion, the patentee says:—"Having now described the nature of my invention, and the manner of carrying the same into effect, I would have it understood, that the same may be varied, in some degree, without departing from my invention; and I would have it understood, that I make no claim to any of the apparatus or processes employed, other than is hereafter more particularly

set forth and claimed as my invention; and what I claim, as my invention, is first, in respect to the manufacture of zinc; the mode of manufacturing zinc from the ores, by applying lime, as above described and set forth; and also the employment of blast furnaces, with suitable condensers or receivers for separating the oxide zinc from the matters with which it is combined; and further,—the mode of distilling the metal in retorts or other vessels, whereby the vapour is not obliged to pass through the mass of material contained in them, as above described. Secondly, in respect to the manufacture of copper,—I claim the mode of manufacturing copper from copper ores, by repeated oxydation of the sulphate produced therefrom, and precipitating the metallic copper by iron, and the concentration, by heat, of water containing copper, and subsequently precipitating the copper by iron, as above described. Thirdly, as regards the manufacture of tin,—I claim the mode of manufacturing tin above described. Fourthly, in respect to antimony,—I claim the manufacture of antimony, as above described."—[*Inrolled in the Inrolment Office, November*, 1838.]

To CHARLES THOMAS HOLCOMBE, *of Bankside, Southwark, iron-merchant, for his invention of certain lubricating or preserving matters, for wheels and axles; applicable also to the bearings, journals, or other parts of machinery.*—[Sealed May 4th, 1841.]

THE specification of this invention runs as follows:—

The object of my invention, so far as relates to lubricating matters, is to render a certain mineral grease, (the production of coal tar, and commonly called napthaline,)

when mixed up and manufactured with the materials, and in the manner described in the first, second, and third processes hereinafter set out, useful and applicable for lubricating the wheels, axles, bearings, and journals of machinery; and the object of my invention, so far as relates to lubricating and preserving matters, is to render a certain mineral oil, (also the product of coal tar, and commonly called dead oil,) when mixed up and manufactured with the materials, and in the manner described in the fourth process herein set out, useful and applicable for lubricating wheels, axles, bearings, and journals of machinery; and for preserving any wheels, axles, bearings, journals, and other parts of machinery, by means of external application thereto, which invention I propose to carry into effect in the manner hereafter described.

First process:—I take the napthaline in the rough and crystallized state, about five hundred weight, and boil it for about three hours, with two or three bushels of tan; and I also boil therewith about thirty-five pounds of soda. Sometimes I boil animal charcoal alone with the napthaline, and sometimes I boil catechu, (commonly called japan earth,) with the napthaline. The napthaline thus prepared, either with the tan or soda, or with the animal charcoal or catechu, is strained through a fine wire sieve, and left to cool; I now melt together about forty pounds weight of resin; and thirty pounds weight of bone or horse fat; thirty-five pounds weight of Russian tallow; and two hundred weight of palm oil, as a mixture; and I grind the mixture with the napthaline, when so prepared, either with tan and soda, or with the animal charcoal or catechu, as aforesaid, in a mill, similar in all respects to a common paint mill.

Second process:—I take about three hundred weight of the napthaline, when prepared as in the first process, either with tan and soda, or with the animal charcoal or catechu;

I then mix with it about twenty-three pounds of black lead; and twenty pounds of Stockholm tar, and I grind the whole together in a mill. The grease, thus formed, is of an inferior quality to that described in the first process.

Third process:—I take about three hundred weight of napthaline, when prepared as in the first process, either with tan and soda, or with the animal charcoal or catechu, and mix it with twenty-eight pounds weight of Stockholm tar, and twenty-eight pounds of bone fat, or any other suitable fatty vegetable or animal substance; I grind the whole together in a mill, and the grease, thus formed, is of a quality still inferior to that described in the second process. Sometimes I add a quantity of resin in the manufacture of the grease, described in the second and third processes: and I decrease, in such second and third processes, the quantity of tan and soda, animal charcoal or catechu, used in the boiling, in proportion to the difference in the quantity of napthaline used in the first, second, and third processes.

In the above description, I do not mean to confine myself to any particular mode or manner, nor to any particular quantities or proportions of the materials or ingredients used; but my claim, is solely for the use of napthaline, as the basis of my invention in lubricating materials.

Fourth process:—I put a quantity, of about fifty or sixty gallons of the dead oil, before mentioned, in a pan or cauldron, and boil it with about one bushel of tan, or I boil the same with catechu alone, or with catechu and tan; I also boil about twenty pounds weight of soda with the dead oil and tan, or with the dead oil and catechu alone, or with catechu and tan; I then strain the mixture off, and let it cool; when cool, I bag it in the same manner as sperm oil is usually bagged: I then add about two pounds weight

of palm oil, or two pounds of horse grease to each gallon of the mixture; but the palm oil or the horse grease may be added in the same proportion before the mixture is bagged.

In the above description, I do not mean to confine myself to any particular mode of manufacture, nor to the particular quantities or proportions of the ingredients used; but my claim is solely for the use of dead oil, as the basis in such lubricating material and preserving matters, when so mixed, in manner aforesaid, with any proportion of animal or vegetable oils or grease.—[*Inrolled in the Rolls Chapel Office, September,* 1841.]

To SAMUEL KNIGHT, *of Woodhouse Mills, in the county of Lancaster, bleacher, for certain improvements in machinery or apparatus for boiling, bricking, or scouring, for the purpose of preparing and assisting the process of bleaching and dyeing cotton, linen, and other fabrics and fibrous substances.*—[Sealed 25th March, 1840.]

THESE improvements in machinery for boiling, bricking, or scouring, for the purpose of assisting the process of bleaching and dyeing linen and other fabrics, consist in a certain novel arrangement and construction of apparatus, adapted to the said purpose, so contrived, that the goods or other fibrous substances to be operated upon, may be packed in suitable vessels or chambers, connected by means of pipes, furnished with suitable stop-cocks, with other vessels containing the alkaline solution, commonly employed in such processes; one of which vessels or cisterns is to be filled with the alkaline solution, and heated until the liquor forces its way through the connecting pipes, and enters the

vessels or chambers containing the goods or fabrics to be operated upon; through which it is exhausted and caused to pass rapidly, by means of the other receptacle of the alkaline solution being nearly empty, and in a state of vacuum,—the fire under the full vessel being kept up, whilst that under the empty one is allowed to lower in temperature.

When the alkaline solution has passed entirely through the goods, and the vessel which was first filled has become nearly empty, the stop-cocks are all to be reversed; and the fire which was under the empty boiler must be raised, in order to force the alkaline liquor back again through the goods; and so on, alternately repeated, as often as the goods will be found to require it.

In Plate XIV., fig. 1, is a longitudinal section, taken vertically, of an apparatus designed for the above purpose; and fig. 2, is a slight modification of the same.

A vessel, containing the ordinary alkaline or other solution, or pure water, as commonly employed in the process of boiling, bricking, or scouring, is shewn at *a*, *a*, furnished with a valve *b*, at top, to relieve the internal pressure, and is placed in a furnace b^1, b^1, which thus heats the liquor, and will pass up the pipe *c*, through the pipe *d*, into the vessel or chamber *e*, *e*. This vessel contains a quantity of goods or fabrics, lying upon the grating *f*, through which the liquor passes; and again up the pipe *g*, into a similar vessel *h*, *h*, also containing a quantity of goods to be operated upon; then up the pipe *i*, and through the pipe *j*, into the other vessel or cistern *k*, *k*, also furnished with a valve *l*, at the top.

It will be observed, that during this passage of the alkaline solution or other liquor, (in the direction of the drawn arrow,) the cocks *m*, *m*, *m*, are all open, and the fire in the furnace b^1, kept up; but, upon the liquor having nearly all passed this way downwards through the goods or fabrics

into the vessel *k*, the cocks *m*, *m*, *m*, must be closed, and the cocks *n*, *n*, *n*, opened, and the fire in the furnace *o*, *o*, in which the vessel *k*, is set, must be increased, and that in the furuace *b*, lowered; thus, the passage of the liquor will be instantly reversed, and the liquor passed upwards again through the goods or fabrics, (in the direction of the dotted arrow,) until the vessel *a*, has again become filled, and then the operations are all to be again reversed. The process to be thus continued, and the liquor thus passed backwards and forwards, through the cloth or goods, as often as found desirable.

A slight modification of this process is shewn at fig. 2, where *a*, *a*, is also a vessel containing the liquor, and set in the furnace *b*. In this instance, the passage of the liquor is effected through the pipes *c*, and *d*, into and out of the chamber *e*, *e*, containing the goods, by means of a pump or pumps *f*, *f*, placed either between the vessels or elsewhere, in connection with them, (which variation of the process is preferred to the foregoing); but this or any other slight variation of the process may be readily made, as found desirable.—[*Inrolled at the Petty Bag Office, September*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS GRIFFITHS, *of Birmingham, in the county of Warwick, tin-plate worker, for his invention of an improvement in the manufacture of tea kettles and other articles now usually made of copper, copper tinned, or plate-iron tinned, or any other metal or metals.*—[Sealed 15th February, 1834.]

THE improved method of forming kettles and other vessels in metal, proposed by the patentee, is by hammering or

pressing between dies, a disc of plate metal, first into a dish form, and then, after annealing the metal, again hammering or pressing it upon a suitably-shaped block or die, and so on, annealing and hammering or pressing, until the desired form is produced.

Many articles of the dish kind, or covers, may in this way be formed from discs, without brazed joints; or if vase shapes are required, two discs may be, in this manner, beaten or pressed into shapes, and joined together by brazing, to form the entire vessel.—[*Inrolled in the Petty Bag Office, April,* 1834.]

To JOHN DONKIN, *of Blue Anchor road, Bermondsey, in the county of Surrey, civil engineer, for certain improvements in the machinery for making paper,—being a communication from a foreigner residing abroad.*—[Sealed 25th November, 1834.]

THIS invention is the construction of wire-web cylinders for paper-making machines, and the combination of two such wire-web cylinders in one machine; by the use of which, two distinct thicknesses of paper pulp are obtained, and are connected together for the production of one thick sheet.

What is called endless sheets of paper, have been made by Fourdrinier's machinery for many years, by depositing the paper pulp upon a travelling wire web; through the interstices of which web, the water percolates and leaves the pulp in a sheet upon its surface, to be taken off by a felt and conducted to a drying apparatus.

The present invention, is an improved mode of constructing cylinders of such wire web, and immersing such cylin-

ders in a vat containing paper pulp; when, by the rotation of the cylinders, the paper pulp is made to attach itself to the outer surfaces of the web, the water draining through the web, and leaving the pulp, as upon an ordinary paper mould, in such a state of adhesion as to allow of its being drawn off in a sheet.

Two of these cylinders are so placed in a vat, that their peripheries may nearly touch each other, and by revolving in opposite directions, bring the two sheets of paper pulp into contact, so as to combine them, or, as it is technically termed, couch them together.

There are contrivances for regulating the quantity of pulp deposited on the surface of the cylinders, so as to produce sheets of paper of any required substance; and there are means of bringing the cylinders into any required proximity, for the purpose of pressing the two sheets of pulp into contact with greater or less force, as may be desired. There is also a vertical partition in the vat, which admits of two different qualities or colours of pulp, being supplied at the same time, so that the couched or double sheet of paper produced, may be of a fine quality on one side, and coarse on the other; or that its two surfaces may be of different colours.

The paper thus made, is taken off by an endless felt or blanket, and conducted to drying cylinders, much in the ordinary way.

The patentee particularly claims the employment of two moulding cylinders, for the purpose of uniting the two thicknesses of paper pulp, and compressing them into one sheet.—[*Inrolled in the Petty Bag Office, May,* 1835.]

To James Hendrey, *of Wormwood-street, in the city of London, surveyor, for his invention of an improved method in laying, or a new combination in the construction of floors in buildings.*—[Sealed 16th February, 1835.]

Flooring boards, after a lapse of time, are apt to shrink in width, and if nailed to the rafters, leave openings in the floor between the boards. To avoid this, the new boards, when first laid, are usually, after being placed in close contact, forced down with great labour and difficulty, in order to compress them laterally, and thereby allow for a small degree of shrinking, as they become more dry and old.

The patentee, to avoid this inconvenience and difficulty, proposes a means by which the boards, however they may shrink, may be readily tightened up, or their sides brought again into close contact.

A groove is cut along the top of each rafter, and a metal block placed therein to support the junctions of every two boards; suitable recesses being made in the under parts of the boards, to receive these blocks.

In Plate XIII., is a sectional representation of part of a floor, so laid. *a, a*, is the rafter; *b, b, b*, flooring boards, laid transversely upon the rafter; *c, c, c*, a groove, cut along in the upper edge of the rafter; and *d*, a metal block, placed in the groove *c*, upon the upper surface of which the rebated edges of the flooring boards rest.

Supposing the boards to have shrunk, after having been laid twelve or eighteen months, and spaces or opening in the floor to have resulted, one of the boards must be taken up, and a cramp introduced between the two edges of the boards which remain. This cramp may be of any convenient construction.—That shewn at *e, e*, is a longitudinal bar, having a right and left-hand screw-thread at its ends, working into transverse bars *f, f*, placed against the edges

of the two flooring boards *b, b.* By turning the bar *e*, by a hand-spike, the bars *f, f*, will be pressed with great force against the edges of the boards *b, b*, and drive them, and all the boards connected with them, up into close contact, thereby closing the openings, between the several boards, caused by shrinking.

The peculiar form of the metal block *d*, is such, that in advancing it, the rounded toe, at the point of its foot, will allow it to slide forward readily; but the sharp-edged heel will prevent its retrograding by biting into the rafter, and thereby hold the boards securely in their advanced positions, and allow the intermediate board to be replaced, and the additional slip, for filling in, to be introduced.—[*Inrolled in the Petty Bag Office, August,* 1835.]

To CHARLES FLUDE, *of Long-lane, Bermondsey, in the county of Surrey, manufacturing chemist, for his invention of improvements in applying heat to the manufacture of alkalies and salts, and for smelting and otherwise working ores, metals, and earths.*—[Sealed 30th January, 1838.]

THIS invention is described as relating to certain methods of applying coke ovens to the purpose of manufacturing alkalies and salts, and smelting and otherwise working ores, metals, and earths, whereby, in addition to the coal giving off the requisite quantity of heat for carrying on such manufacture, the useful product of coke is obtained from it, instead of using such coal in the ordinary fireplaces or furnaces, in which destructive combustion of such fuel is the result of the working.

The patentee says;—I would remark, in the first place, that I am aware that attempts have been made to apply coke ovens to some of the manufactures above mentioned; I do not, therefore, claim such application, but only under

such circumstances as herein explained; and I may here observe, that my invention only relates to certain modes of applying coke ovens in substitution of the ordinary furnaces or fire-places, of the various processes above mentioned, and does not interfere with the processes themselves; it will not, therefore, be necessary to enter into a description of such processes, they being well understood."

The claim of invention is as follows:—"Having thus described my invention, and the manner of performing the same, I would have it understood, that what I claim, as my invention, is firstly,—the application of coke ovens, when combined with means for supplying heated air thereto, or to the flues thereof, to the processes herein explained; secondly,—I claim the application of a hopper or hoppers to a coke oven, when applied to the purposes above described; and thirdly,—I claim the application of coke ovens to salt pans, for making salt, when such ovens are applied in a position not *under* the pan, but only giving off heat thereto by flues passing under the pan, whether such application be accompanied or not by the use of heated air or hoppers, as above described.—[*Inrolled in the Inrolment Office, July,* 1838.]

To George Harrison, *of Carlton House Terrace, surveyor, for his invention of improvements for supplying air for promoting and supporting the combustion of fire in close stoves and furnaces, and for economising fuel therein.*—[Sealed 17th October, 1838.]

This invention is described as consisting of the following arrangement or disposition of parts:—

"First,—There are spaces for air made in the two sides of the stove; and in these spaces air conductors are

adapted for introducing the external air through the aperture of a three-quarter of an inch iron pipe, bent and conducted from the upper part of the fire-place, and carried downwards close underneath the fire-bars, for the admission of air.

"Secondly,—Two three-quarters of an inch air-conducting pipes are fixed to the front of the apparatus, stove, orfire-enclosure, and adapted to enter into the fire through them when the intensity of heat is great. The air-pipes are five-sixths less in diameter than at their entrance in stoves, and three-sixths less in furnaces. For the latter, the *apertures* (we suppose the patentee here means the air-pipes) should be widened at the mouth, in order to spread the air that is admitted into the fire; for furnaces, the air-conducting pipes may be placed wholly in front, in case it might not be convenient to adapt them to the sides; so that they are adapted at the level of the top of the fire, and conducted to close underneath the base of the grate, holding the fire where the air circulates and passes through it. These spaces are to be made to vary in proportion to the size of the fire-place, allowing equal to inch spaces or apertures for every six cubic inches contained in the fire-place.

"Thirdly,—The door should be perforated with small apertures, three-sixteenths of an inch in diameter, which may be varied also according to the size of the fire-place, reckoning from the cubical contents of the fire-place, stated in my first and second claims.

"Fourthly,—An inch air-pipe is to be constructed at the back of the fire, for the same proportion of fire-place.

"The above is the lucid manner in which the patentee explains his invention. The specification is accompanied by a small drawing, which we have not thought it necessary to shew; and he concludes by saying:—" The within-mentioned application of the apertures, for supplying air

to the fire, are to be used with closed ash-pits or drawers." The useful purposes to which these improvements are applicable, are to cause a great saving in all sorts of fuel, more especially that description of fuel, where the gaseous products consist chiefly of carbon, such as are anthracite or coke; and for the purpose of causing the fire to burn more regularly, and for the more effectually supporting combustion, without the combustion being too rapid, with a view to economise fuel, as before mentioned, and render the air more effectual, by which the combustion is supported."—[*Inrolled in the Inrolment Office, April,* 1839.]

To JOHN WILLIAM NYREN, *of Bromley, manufacturing chemist, for improvements in the manufacture of oxalic acid.*—[Sealed 26th June, 1840.]

THIS invention consists in manufacturing oxalic acid from the following substances: First,—a product obtained from potatoes: Second,—a product obtained from horse-chestnuts; and the invention relates, Thirdly,—to a mode of manufacturing oxalic acid, by means of leaden vessels.

In employing potatoes, the roots are first well cleansed, and then reduced, by grinding, rasping, or otherwise, to a fine pulp, which is washed by placing it in water and stirring it therein;—the pulp is then permitted to subside, and the water drawn off. The pulp thus obtained, is placed in an open leaden vessel, and submitted to the action of acid or diastase; then, as much water is to be added as will allow the contents of the vessel to boil freely, heat being applied by leaden steam pipes or other convenient means. Sulphuric acid is to be added to the mixture in the proportion of two per cent. by weight of acid, to the quantity of pota-

toes employed; and the whole is boiled some hours, till the farina contained in the potatoes is converted into the state desired. The liquor thus obtained, is then filtered through a horse-hair cloth, and the clear liquor carefully evaporated in any convenient vessel, until it is about fourteen and a half pounds to the imperial gallon;—in this state, it is in a condition to be converted into oxalic acid, by applying acid in the same manner as is now practised when employing sugar.—The subsequent operations or processes for completing the manufacture, are similar to those now in use.

As regards the second part of the invention, the only difference in the treatment of the horse-chestnuts is, that they do not require washing, but the outer skins must be removed; in other respects, the above description is perfectly sufficiently.

The third part of the invention consists in the application of leaden vessels, or vessels lined with lead, instead of the earthenware jars or vessels now used, and which must necessarily be of limited dimensions, and consequently a very large number would be required when manufacturing on a large scale; it is therefore important to obtain larger vessels; and the patentee says he has found, that vessels lined with lead, of any suitable dimensions, may be employed when using nitric or nitrous acid; and in order to heat the liquor contained therein, a coil of leaden pipe is placed in the vessel, and steam or hot water made to circulate through it.

In conclusion, the patentee says:—" I lay no claim to treating the farina of horse-chestnuts or potatoes with sulphuric acid or diastase, except when applied to the manufacture of oxalic acid; but I claim, first, the mode of manufacturing oxalic acid by the application of a product obtained from the farina of potatoes and sulphuric acid or diastase, as above described; secondly, the mode of manufacturing oxalic acid by the application of a product ob-

tained from horse-chestnuts and sulphuric acid or diastase, as above described; and thirdly, the mode of manufacturing oxalic acid by means of converting proper liquors, prepared with nitric or nitrous acid, in leaden vessels, as above described."—[*Inrolled in the Inrolment Office, December,* 1840.]

To THOMAS TASSELL GRANT, ESQ., *an Officer in Her Majesty's Victualling Yard, at Gosport, for his invention of improvements in the manufacture of fuel.*— [Sealed 13th July, 1840.]

WE are at loss to know in what the novelty of this invention consists, as the materials mentioned as intended to be employed for the manufacture of fuel, have been used many years for a like purpose, many slightly varied combinations having been patented by different individuals; but, in order that there may be no mistake, and being fearful least we should not have discovered the real essence of the invention, we give the patentee's own words, which are as follow: —

"The fuel is composed of coal-dust, and a preparation of coal-tar or other bituminous material. The coal-tar or other bituminous material is converted, by the influence of heat, into a substance resembling pitch; and two gallons, or twenty pounds weight of this pitch, or other bituminous material, reduced to a liquid under the influence of heat, are combined with one hundred weight of coal-dust, and the composition moulded into the form of bricks."— [*Inrolled in the Petty Bag Office, January,* 1841.]

List of Patents

Granted by the French Government from the 1*st of July to the* 30*th of September*, 1840.

(Continued from page 306, Vol. XIX.)

PATENTS FOR TEN YEARS.

Poole, of London, for an apparatus to be used in the photogenic system, as a substitute for the camera obscura.

Poole, of London, for an improved method of working zinc.

Postel, Junr., of Villers-Bretonneaux, for a new turbine wheel.

Pouillet, of Paris, for wooden wedges for rail-roads.

Pourchet, of Paris, for impressions of engravings.

Quenin, of Rouen, for a new loom.

Querini, of Paris, for improvements in the manufacturing of felt.

Renaudot, of Paris, for new Persian shutters and frames of glass windows in zinc.

Renaudot and Dejardin, of Paris, for water pipes in zinc.

Renour, of Crossays, for improvements in the making of cordage.

Revillon and Pernon, of Maçon, for hydraulic machines.

Richard, of Lyons, for an improved brocading loom.

Richardson, of London, for improvements in omnibus carriages.

Ringuelet, of Chalons, for a new cast-iron stove.

Robert de Massy, of St. Quentin, for a new method of using the residue in the distillation of wine.

Rodier, of Autun, for a press for grinding earth.

Roussin, of Paris, for a wheel intended for raising stones out of quarries.

De Salles-Rougé, of Paris, for a new kind of brandy.

Sanguinide and Capt, of Geneva, for new piano cords.

Sarrey, of Maçon, for an improved machine for thrashing wheat.

Seaward, of Poplar, near London, for an improved steam-engine.

Siseo, of Paris, for improved clogs.

Stinzel, of Gray, for an improved rotary steam-engine.

Symian, of Paris, for an improved rotary steam-engine.

Tessier, of Paris, for extracting salt from soap-suds.

Tresca and Eboli, for improvements in the manufacture of stearic candles.

Vardy, of Wolverhampton, for improvements in the machinery for drawing iron.

Vardy, of London, for improvements in the manufacturing of nails, &c.

Vauquelin, of Paris, for a mechanical process for currying leather.

De Villeneuve, of Paris, for exotic fibrous substances, to be used instead of wool.

Whitaker, of Mézières, for improvements in the manufacturing of cards.

White, of Paris, for hats, which prevent the wearer from being drowned.

PATENTS FOR FIVE YEARS.

Augros, of Villeneuve, St. George's, represented in Paris by M. Perpigna, advocate of the French and Foreign Patent Office, Rue Choiseul, 2 ter, for a new wind-mill.

Austin, represented in Paris by M. Perpigna, advocate, for improved warp machines.

Dufaure de Montmirail and De Beaurepaire, represented in Paris M. Perpigna, advocate, for buckles without tongues.

Fabre, represented in Paris by M. Perpigna, advocate, for an improved filter.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 303, Vol. XIX.)

April 20, 1841.

The PRESIDENT in the Chair.

"Experiments for determining the position of the neutral axis of rectangular beams of cast and wrought iron and wood, and

also for ascertaining the relative amount of compression and extension at their upper and under surfaces, when subjected to transverse strain." By Joseph Colthurst.

These experiments were undertaken in consequence of the difference of opinion which has long existed respecting the position of the neutral axis of extension and compression of iron and wood.

Two series of experiments were made to determine this point by cutting through the centre of each of a set of eight girders, each 6 feet 6 inches long, 5 inches deep, and $\frac{1}{2}$ inch thick, the first to the depth of $\frac{1}{2}$ an inch, the second to the depth of 1 inch, and so on, to the eighth girder, in which only 1 inch of metal remained unsevered. The spaces cut out were then filled with carefully fitted wrought-iron keys, and the girders were broken by the application of weights, in the expectation that these weights would be some indication of the neutral point of each girder. The results were, however, so irregular, that no satisfactory deduction could be drawn from them.

The next attempt was made in the manner suggested by the late Mr. Tredgold, by drawing two fine lines, $2\frac{3}{4}$ inches apart, on a polished surface, at right angles to a girder, in the middle of its length; it was then subjected to strain, and dimensions were sought to be taken to determine where their divergence and convergence commenced, but the differences were too small to be susceptible of accurate determination, otherwise than by a fine micrometrical operation, which at the time the author had not an opportunity of applying. The following plan was therefore adopted.

In the side of a cast-iron girder, 6 feet 6 inches long, 7 inches deep, and 1 inch thick, a recess was planed at the centre, 3 inches wide by $\frac{1}{4}$ inch deep. This was filled up very true, and fourteen small bars of wrought iron, with conical ends, were placed in it at regular distances of $\frac{1}{2}$ an inch apart. These bars were of such lengths as to hold sufficiently tight to carry their own weight, and yet that the slightest touch should detach them. The girder

was then subjected to strain. The supports were 6 feet apart; with a strain equal to 100 lbs., the lower bar fell out;—as it was increased, they continued to drop; and with 1500 lbs. all those below the centre had fallen. The strain was then increased to 7000 lbs., but no more bars fell. The centre bar remained exactly as when put in; all those above the centre became firmly fixed, and were evidently under considerable compressive force. The strain was then gradually taken off, and all the bars above the centre fell out, their ends having become compressed by the sides of the recess pressing on them; they were of course too short when the girder resumed its former condition, and the recess its previous width. These experiments were repeated several times, with pieces of fine wire and dry lance-wood charred at the ends.

The result in every case showed that the *neutral axis* of extension and compression was certainly situated within 9-10ths of an inch of the centre.

Another experiment was still more decisive. A girder 9 feet 6 inches long, 8 inches deep, 1 inch thick, was cast with two brackets or projections on the side, each 9 inches on either side of the centre. A brass tube bar, with circular ends and a sliding adjustment, was fixed between the brackets, which had been filed true. The clear bearing was 7 feet 6 inches; a strain of 50 lbs. was sufficient to cause this bar to drop out; and with 250 lbs. the whole effect of the previous experiment was produced. The tube, when placed loosely, 1 inch above the centre, was held fast by a strain of 1000 lbs.

Similar experiments were then made on wrought iron, with precisely the same results, showing that the neutral axis, if not actually situated at the centre, was nearly identical with it.

A similar series of experiments, made upon wood beams, gave exactly the same results as regarded the position of the neutral axis.

From all the foregoing experiments, the author concludes that the neutral axis of extension and compression in rectangular beams of cast and wrought iron and wood, is situated at the

centre of their depth, when those beams are subjected to transverse strains.

Experiments were also instituted to ascertain the amount of extension and compression of cast and wrought iron and wood.

Upon a bar of cast iron, 3 inches square, and 9 feet long, two strips of thin hoop iron were attached, the one on the upper, and the other on the lower side, each strip being fastened to the bar at one end only, while the other end was left free; any change which occurred in the length of the surface to which it was applied, was clearly indicated. The differences were recorded by very fine lines on a polished surface. The strips were 7 feet 6 inches long, and were bound to the whole length of the beam by bands of fine wire, wound round and enclosing them at every 9 inches; the beam was then subjected to strain, and the following results were obtained:—

Weight. lbs.	Deflection. inches.	Compression. inches.	Extension. inches.
1000	0·22	...	...
2000	0·45	0·04½	·04½
3000	0·65	0·06	0·06
4000	0·87	0·08	0·08
5000	1·20	0·11	0·12
6000	1·50	0·13	0·14

6240 the beam broke; good iron; showing a good clear fracture.

It will be perceived, that until rather more than two-thirds of the breaking weight was put on, the amounts of extension and compression did not sensibly differ, but between that point and the breaking weight, extension yielded in a higher ratio than compression.

Similar experiments were next made on bars of wrought iron, 2½ inches square; the supports were 13 feet 6 inches apart; and the strips of hoop iron were 12 feet long.

Weight. lbs.	Deflection. inches.	Compression. inches.	Extension. inches.	Elasticity impaired.
500	0·55	0·03	0·03	...
1000	1·55	0·06	0·06	...
1280	1·45	0·07	0·07	0·15

1560	1·85	0·08	0·08	...
1800	2·20	0·09	0·09	...
2000	2·70	0·11	0·11	0·65
2280	4·15	0·18	0·19	2·05

With this weight the beam was permanently bent, and its elasticity nearly destroyed.

These experiments showed that, differing from cast iron, the amounts of extension and compression in wrought iron continue to be equal up to the complete destruction of the elasticity of the beam.

The amounts of extension and compression in rectangular beams of fir timber, when subjected to transverse strain, were next determined; the manner of proceeding was precisely the same as in the preceding experiments.

A batten, 4 inches by 3 inches, with the supports 8 feet 2 inches apart, and with strips 7 feet 6 inches long, when subjected to transverse strain, gave these results:—

Weight. lbs.	Deflection. inches.	Compression. inches.	Extension. inches.
500	1·10	0·12	0·12
1000	2·30	0·24	0·24

From these experiments on the amount of extension and compression of cast iron, measured at the under and upper surfaces of rectangular beams, subjected to transverse strain, the author assumes, that within limits which considerably exceed those of elasticity, and equal to at least two-thirds of the breaking weight, there is no sensible difference between the amounts of compression and extension, and that as the breaking point is approached, extension yields in a higher ratio than compression, and gives way first.

It would appear certain that up to the point when the elasticity of wrought iron is completely destroyed, and the beam is bent, the amounts of compression and extension continue exactly equal, and it is therefore probable that this equality would continue to the last.

It is clear that the amounts of extension and compression up to three-fourths of the breaking weight, do not sensibly differ in

fir battens, but that as the ultimate strength of the beam is approached, compression yields in a much higher ratio than extension, and may be actually seen to give way first.

He states also, that the amounts of extension and compression are in direct proportion to the strain, within the limits of elasticity, and that even after those limits are greatly exceeded, and up to three-fourths of the strength of a beam, they do not sensibly differ.

The apparatus with which these experiments were made, was exhibited, and presented by the author to the Institution.

Mr. Donkin eulogised the novel and ingenious manner in which Mr. Colthurst had conducted the experiments, which he considered to be highly satisfactory. They not only determined the position of the neutral axis of the beams experimented upon, but showed also the relative amounts of compression and extension, so as to demonstrate that the elasticity of a body was the same in compression as in extension. These experiments also confirmed the correctness of Tredgold's opinion as to the pernicious effects of attempting to produce peculiar forms in beams by cambering and inserting wedges into their upper sides.

Mr. Vignoles reminded the meeting of the discussions which had taken place relative to the position of the neutral axis in the Railway Bars, which had the upper and under tables similar; it was contended that the neutral axis was situated close beneath the upper lip, or table of the rail, whereas, if Mr. Colthurst's mode of experimenting had been adopted, a different and more correct result would have been arrived at.

Mr. Cubitt accorded great merit to Mr. Colthurst for the experiments, which had determined the question as regarded rectangular beams. It appeared that no attempt had been made to use the same mode of proceeding with beams of irregular figures; in them, therefore, it might be concluded, that the neutral axis would be found in the centre of gravity of the section of the beam.

Mr. J. Horne remarked, that these experiments perfectly

accorded with those which he laid before the Institution in 1837. His object had been to show that the neutral axis was always in the centre of gravity of the section, as well as to determine the figure which should resist the greatest amount of pressure with a given quantity of materials: the strongest form was shown to be a prism, placed with the base upwards, and the same figure reversed was the weakest; the strength of the former figure exceeded that of the latter by at least one-third.

April 27, 1841.

The PRESIDENT in the Chair.

"Memoir of the Montrose Suspension Bridge."

By J. M. Rendel, M. Inst. C. E.

Previous to the year 1792, the passage of the River Esk at Montrose was effected by common ferry boats; at that period an act of parliament was obtained for the construction of a wooden bridge, with numerous arches, or rather openings formed by beams, supported upon piles, with stone abutments at either end: the action of the tide undermining the piles, and the usual progress of decay causing great expense for repairs, it was decided in the year 1825, to erect a Suspension Bridge, the ironwork of which was contracted for by Captain Samuel Brown, R.N., for the sum of £9430., and the masonry of the towers for £9080. The total cost being £18510., exclusive of the land arches and approaches; those of the old bridge being preserved for the new one.

The dimensions of the new bridge were—

	Feet.
Distance from centre to centre of the towers ..	432
Deflection of the chain or versed sine of the catenary	42
Length of the suspended roadway	412
Width of ditto	26
Height of ditto above low water	21
Ditto of the towers above ditto	68

Base of the towers at the level of the roadway 40 ft. by 20
Archways through the towers, 16 ft. wide and 24 ft. high.

The towers were built of red sandstone ashlar, raised on a base of the same material, carried upon piles.

There were two main chains on each side, arranged above each other in parallel curves, 12 inches apart. Each chain was composed of four bars of iron, 5 inches wide by 1 inch thick, and 10 feet long, united by short plates, and strong wrought-iron pins. The road-way was suspended to these chains by perpendicular rods, 1¼ inch in diameter, attached at intervals of 5 feet, alternately to the upper and lower lines of main chains, at the joints, which were arranged so that those of the upper chain should be over the long bars of the lower one; at the lower end of each suspending rod was a stirrup, which received and carried the cast-iron bearers for supporting the roadway.

Upon these bearers was laid and rivetted longitudinally a flooring of fir planks, 3 inches thick, and well caulked; upon this a sheathing of fir, 1½ inch thick, was placed transversely, and spiked to the lower planks; over all was spread a coating of about 1 inch thick of fine gravel and sand, cemented with coal tar.

The suspending rods were without joints. The main chains rested upon detached cast-iron saddles, built into the masonry of the towers, and passing down at either extremity, were secured behind cast-iron plates, in masses of masonry, 10 feet under ground.

The construction was commenced in September, 1828, and was finished in December, 1829, a period of only sixteen months.

On the 19th of March, 1830, about seven hundred persons assembled on the bridge to witness a boat race, when one of the main chains gave way, and caused considerable loss of life. The injury was speedily repaired, but a careful survey of the structure was ordered, and it was discovered that the intermediate or long links of the chains, bore so unequally upon the saddles, as to be bent and partially fractured. Mr. Telford, who was consulted on the subject, proposed the addition of two other main chains, placed above the original ones, and having the same

curve, so as to increase the sectional area 40 inches—thus giving six chains of 20 inches area each, instead of four chains, as originally constructed.

Mr. Telford's decease occurring at that period, the author was instructed to report upon the state of the bridge, and advise such alterations as he judged to be necessary.

After a minute personal inspection, he concurred in Mr. Telford's idea of the necessity of increasing the strength of the bridge, but instead of augmenting the number of the chains, he advised the addition of two bars in width to each of those existing, by which means the required strength might be gained. He was led to this by an opinion that, in all cases, it is desirable to have as few chains as possible.

It appeared that there had been but little precision in the workmanship of the chains; for on releasing them, they immediately became twisted; thus showing that all the links had not a true bearing. On taking them apart, many of the traversing pins were found to be bent, and some of them were cut into, evidently by the friction of the links. This was to be rectified, and new saddles of a different principle and stronger form were recommended: also, that those parts of the chains which rested in the saddles, should be entirely composed of short plates. Additions to the masses of masonry holding the chains, were likewise deemed advisable.

Between the years 1835 and 1838, all the principal works, with many minor improvements, were executed.

In the author's report on the state of the bridge, he noticed what he deemed defects in the construction of the roadway, but as there was no positive symptom of failure, it was allowed to remain. He conceived, that in the anxiety to obtain a light roadway, mathematicians and even practical engineers, had overlooked the fact, that when lightness induced flexibility, and consequently motion, the force of momentum was brought into action, and its amount defied calculation.

On the 11th of October, 1838, the roadway of the bridge was destroyed by a hurricane, the effect of which upon this structure

is the subject of a paper by Colonel Pasley, published in part 3, vol. 3, of the Transactions of the Institution C. E. To that account the author refers for the principal details, only adding, that on inspecting the bridge, he found the chains, the saddles, and the fastenings or moorings, quite sound; the principal portion of the roadway had been completely carried away, and the remainder much injured. He then gives some account of the undulatory motion observed during the storm. This motion was greatest at about midway between the towers and the centre of the roadway; but the waves of the platform did not coincide with those of the chains, either in magnitude or in order; no oscillatory motion was perceived either in the roadway or in the chains, although particular attention was directed to them.

It appears that the centre of the platform fell in a mass. This the author attributes to the failure of the suspension rods, which, having no joints, were twisted off close to the floor by the undulatory motion. A similar occurrence at the Menai Bridge induced Mr. Provis to adopt the joints in the suspension rods, which the author had previously introduced at the Montrose Bridge.

The author had long been convinced of the importance of giving to the roadways of suspension bridges the greatest possible amount of stiffness, in such a manner as to distribute the load or the effect of any violent action over a considerable extent.

The platforms of larger bridges, in exposed situations, are acted upon in so many different ways by the wind, that he had an objection to the use of stays or braces to counteract movements which ought rather to be resisted by the form of the structure.

Holding such opinions, he determined to adopt a framing which, although connectedly rigid in every direction, should nevertheless be simple, composed of few parts, capable of being easily renewed; should distribute its weight uniformly over the chains, not be subject to change from variation of temperature, and not augment the usual weight of suspended platforms.

The details of the alterations, and general repair of the bridge, are then given; a few may be mentioned.

An entirely new set of stronger suspending rods was introduced; they were 1-$\frac{5}{8}$ths of an inch in diameter down to the flexible joint at the level of the platform; below that point the diameter was increased to 1-$\frac{3}{4}$ths of an inch, and a strong thread was cut on to the lower end, so as to adjust them to the requisite lengths.

In the place of the cast-iron bearers, cross beams were substituted, composed of two Memel planks, 13 inches deep, 3$\frac{1}{2}$ inches thick, bolted together, and trussed with a round bar 1-$\frac{1}{8}$th inch diameter; every sixth beam had a deep trussed frame on the under side, so as to give great stiffness. Above and beneath the cross beams, on each side of the carriage-way, were bolted two sets of longitudinal timbers, four in each set; they were further united by cast-iron boxes, at intervals of 10 feet; and the ends were secured to beams of English oak, built into the masonry of the towers. A curb of Memel timber, 11 inches by 6 inches, was attached to the ends of the cross bearers, and extended the whole length of the platform.

The planking of the footways was composed of narrow battens, 2 inches thick, laid transversely from the inner longitudinal beam to the outer curb-piece, with an inclination or drip of 1$\frac{1}{2}$ inch in 5 feet.

The carriage-way was formed of four thicknesses of Memel plank; the two lower layers, each 2 inches thick, were placed diagonally with the transverse beams, crossing each other, so as to form a reticulated floor, abutted against the longitudinal beams; they were firmly spiked to the beams, and to each other, at all the intersections, and upon them was laid and spiked a longitudinal layer of Memel planking, 2 inches thick. Over the whole was fixed, transversely, a layer of slit battens, 1$\frac{1}{4}$ inch thick. Each layer was close jointed and caulked, and the upper one was laid in a mixture of pitch and tar. A composition of fine gravel and sand, cemented with boiled gas tar, was laid over the whole, to the thickness of 1 inch, forming the road track.

To add to the stiffness afforded by this construction, the author caused to be passed through the spaces between the pairs of longitudinal beams, a series of diagonal truss-pieces of Memel timber, 6 inches square, with their ends stepped into the cast-iron boxes, which, at every 10 feet, grasp the beams. On the other ends of these diagonal truss-pieces, cast-iron boxes were fixed, which received the straining pieces, placed 3 feet 6 inches above, and the same depth below, the roadway: an iron screw bolt, 1¼ inch diameter, at every 10 feet, and a contrivance of wedges in the cast-iron boxes, enabled any degree of tension to be given to the framing.

The roadway was thus stiffened by two of the strongest kinds of framing, in parallel lines, dividing the carriage-way from the foot-paths; it was deemed preferable to disconnect them from the suspending rods, and, by bringing them nearer together, to avoid a twisting or unequal strain. The whole formed a compact mass of braced wood-work, the diagonal planking giving the horizontal stiffness, and the two trussed frames insuring the vertical rigidity.

The weight of the new roadway was—

	Tons.	Cwt.
Wood work	130	19
Cast and wrought-iron about ditto ..	36	6
Wrought-iron in the suspending rods ..	20	14
Ditto in the fencing	8	18
Gravel concrete	30	0
Total	226	17

Or 47·5 lbs. per square foot, superficial, for the entire roadway.

The weight of the original roadway was—

	Tons.	Cwt.
Wood work	69	0
Cast-iron about ditto	92	0
Wrought-iron in the suspending rods ..	12	9
Gravel concrete	30	0
Total	203	9

Or 23 tons less than the new roadway.

The platform described is 412 feet long, and 27 feet wide; it cost £4026., or about seven shillings and three-pence per superficial foot.

The works were completed in the summer of 1840; the bridge has borne, without injury, the gales of the last winter; and the stiffness of the platform has given confidence in its strength to all who have examined it.

Five elaborate drawings of the bridge, giving all the details of its construction, on a large scale, accompanied this communication; they were presented by Mr. Page on his election as an Associate of the Institution.

Mr. Seaward agreed with Mr. Rendel in the advantage of reducing the number of suspension chains, and thus rendering the whole construction as simple as possible. The trussed framing, which appeared to be the main feature of this bridge, was particularly deserving of commendation, as it imparted a degree of stiffness to the platform which had not hitherto been attained in other cases, although it was demonstrated to be the best method of preventing the undulation which was so prejudicial to the suspension bridges.

Mr. Rendel had, on a previous occasion, explained his view of the action of wind upon the platforms of suspension bridges, and of the necessity of a certain degree of stiffness in the construction; this he conceived would always be better attained by having a simple well-trussed framing to prevent undulation, than by the application of braces or stays to check either undulation or oscillation—the latter being in his opinion only the result of the former.

He would now only insist more forcibly upon those points. The roadway should be so stiff as to prevent as much as possible all tendency to motion, because it added to the natural decay of every part of the structures; for instance, he found on taking down the chain of the Montrose Bridge, after seven or eight years' wear, that the pins of the links were cut some depth into; de-

monstrating how great had been the amount of motion among the links. In constructing suspension chains, after this experience, he should be inclined to abandon the circular form for the pins, and forge them of a long oval shape in their transverse section; making the apertures in the links by drilling two holes, and cutting out the metal between them with a machine; this form of pin would allow sufficient play for the necessary curve of the chain, while the pin itself would be stronger; would weaken the link less than the large circular hole, and would be less expensive to manufacture. He disapproved of all the complicated contrivances for allowing expansion of the main chains; he had found that plain saddles of proper form were quite sufficient to permit the expansion of the back chains, which was all that required attention.

Mr. Palmer mentioned, on the authority of Mr. Chapman, the destruction of a suspension bridge in America, caused by the sudden passing of a drove of cattle when frightened. This was peculiar, as it always had been considered that an irregular motion was innocuous, but that when any regular impulses were communicated, there was danger of fracture of the bars.

Mr. Vignoles eulogised this excellent communication for the practical conclusions which it contained. Mr. Rendel had materially assisted in affording facility of communication by the introduction of the floating bridges, in communication with railways, and it was not difficult to forsee that, by carrying out the system of adapting well-trussed framings to the platforms of suspension bridges, sufficient rigidity would be attained for locomotive engines and carriages on railways, to traverse rivers or ravines by means of these bridges, instead of by costly viaducts or heavy embankments.

Mr. Rendel saw no difficulty, in giving any required amount of rigidity to the platforms; it was only necessary to increase the strength of the framing, to enable the roadway to bear with perfect safety the passage of an engine and a train of carriages.

The President directed the attention of the Members to what he considered the most valuable part of this interesting commu-

nication—the detection of the errors in the original construction of the bridge. This was the most useful class of papers which Members could present to the Institution, and they were particularly valuable when they were illustrated with such complete drawings as those now communicated by Mr. Page on his election. He hoped this example would be extensively followed.

He mentioned, that an attempt had been made to carry a railway across the Tees by a suspension bridge, but it had been abandoned.

Mr. Rendel understood that the weight of the trains had so stretched the chains, or rather forced the moorings of the back chains of the bridge over the Tees, that the platform sunk in the centre so as to prevent the passing of the carriages; piles had therefore been driven beneath each bearer of the roadway, and the chains now remained merely to show that it had formerly ben a suspension bridge.

May 4, 1841.

The President in the Chair.

"Supplementary Account of the Use of auxiliary Steam Power, on board the 'Earl of Hardwicke' and the 'Vernon' Indiamen."

By Samuel Seaward, M. Inst. C.E.

The advantage of the employment of auxiliary steam power, on board large sailing ships, had been shown by the author in a former paper; it was now further exemplified by the result of the recent voyages of the "Earl of Hardwicke" and the "Vernon."

The former vessel, of 1000 tons burthen, with one engine of 30-horse power, effected the voyage from Portsmouth to Calcutta in 110 days, a much longer time than usual; but still with an advantage of 29 days over the "Scotia," a fine vessel of 800 tons, which sailed one week before the "Hardwicke," and arrived 22 days after her. During the voyage, the "Hardwicke" used her engine 364 hours, and was propelled by it 946 knots; an average

of nearly three knots per hour; while in a calm, with the ship steady, she made five knots per hour. The total consumption of fuel was 90 tons.

The "Vernon," which sailed one month after the "Hardwicke," made her passage to Calcutta in 97 days; passed the "Scotia," and arrived seven days before her, gaining 42 days upon her during the voyage. The "Vernon's" consumption of fuel was also 90 tons, but the copy of her log not being arrived, the number of hours during which steam was used, could not be ascertained.

The "India" steam ship, of 800 tons burthen, with engines of 300 horse power, had not arrived at Calcutta, although she had been out 109 days, so that the "Vernon," with only auxiliary steam power, had already gained 12 days upon her.

The comparison between the advantages of these two vessels, in point of expense, is then fully entered into, and shows a saving of £3733. in favour of the "Vernon," on a single voyage, while she gained at least 12 days upon the "India," in point of time.

This communication is accompanied by a copy of the log of the "Earl of Hardwicke," and by letters from the captains of that ship and the "Vernon," speaking in the highest terms of the assistance of the steam power in certain parts of the voyage.

"Description of an improved Levelling Staff, and a modification of the common Level." By Thomas Stevenson.

In enumerating the advantages of this improvement, the author passes in review the different levelling instruments in general use. He describes the self-reading staff as very useful, but ill adapted to the extreme accuracy generally necessary in the operation of levelling.

He considers the running level to be equally inadequate, from the difficulty of attaining a precise coincidence in cross wires and the vane line.

On the authority of Mr. Simms, in his Treatise on Mathematical Instruments, he states that these evils are in some measure remedied by Mr. Gravatts' rod, but he still considers that instrument to be imperfect. He therefore caused a rod to be constructed by Mr. Adie, of Edinburgh, the vane of which is adjusted by tangent screws. The range of this staff is 12·7 feet, and the graduation so perfect, as to be read by verniers to the 1000th of a foot. On the right of the lower portion of the rod there is a screw, which, on being tightened, clamps the vane; and on the opposite side is the tangent screw for adjusting it. Supposing it in practice that the level line strikes the lower half of the rod, the vane and screw are then easily moved by the hand to within $\frac{1}{4}$ inch of the point, and then, by means of the tangent screw, perfect correctness can be attained.

After having sent his communication to the Institution, the author learnt from the Secretary that adjusting screws had already been used in two other levelling staves, by Captain Lloyd and by Mr. Bunt. He was not, however, aware of this circumstance, and he considers that these instruments, being adapted only for scientific purposes, are hardly suitable for the ordinary use of the Engineer.

The author also introduced a ball and socket joint at the junction of the legs of the common level, retaining at the same time the parallel screw plates, and adding beneath a small sluggish spherical level. By these means, the surveyor is enabled to station the instrument, regardless either of the inequalities of the ground, or of the inclination of the telescope to the horizon.

When in use, the clamp of the ball and socket is released, and the head of the level moved until the bubble shall be in the middle of the circle; the socket screw is then clamped, and the telescope brought to the absolute level by means of the parallel screws. It becomes thus unnecessary to move the legs of the instrument when once fixed.

"An improved mode of Paving Streets."

By Edward Lomax, Assoc. Inst. C. E.

In this communication, the author proposes to remedy the danger and difficulty of stopping or turning horses during wet or frosty weather, on wood pavement. His plan is, that a breadth of 2 feet 6 inches, near each side of the street, should be paved with stone, for the horses to travel upon, the carriage wheels still running upon wood; by which means all the advantages of that kind of pavement would be preserved without risk to the horse. In very wide streets a centre track might also be paved with stone.

By this plan the labour of the horse would be greatly diminished, a considerable portion of his power being now lost, because the wood pavement is less favourable for the footing of the horse than for the motion of the wheels.

The author is therefore of opinion, that granite pavement for the horse to travel upon, and wood pavement for the wheel way, would form a road on which the horse would work with the least loss of power, and the greatest safety.

A model of the proposed improvement accompanied the paper.

Mr. Macneill presented three specimens of the Sea-weed with which the Sea Embankments are formed in some parts of Holland.

He described one of the specimens, in its natural state as resembling the weed which is collected by the peasantry on the western and north-western shores of Ireland, and used by them for bedding.

The second specimen was taken from near the bottom of the embankment at Niewe Diep, the entrance of the grand canal near the Helder. It was much compressed, but elastic.

The third specimen was less compressed; it was taken from the same embankment, above the range of the ordinary neap tides.

This embankment is of considerable width, and has very little slope towards the sea; the work appeared extremely compact and solid; he saw it when a heavy sea was running in, and each action of the waves against it caused a vibration throughout the whole mass—thus proving the elasticity of the material when consolidated, and corroborating the Hon. Mr. Stewart's description of the same effect upon the peat sod embankments, in a paper shortly to be laid before the Institution. Mr. Macneill spoke with confidence of the efficiency of the peat sod for sea defences, as he had used it with good effect, although at present only to a limited extent.

The attention of the Members of the Institution was especially directed to the sea embankments of Holland, as affording excellent study and ample materials for communications for the meetings.

Scientific Adjudication.

COURT OF EXCHEQUER CHAMBER,

November 16th, 1841.

Neilson and others *v.* Harford and others.

This was an issue from Chancery in a suit for infringement, to try the validity of a patent for heating air before entering the blowpipe, for the purpose of smelting. The cause was tried before Baron Parke, and a verdict found for the patentees* on the four principal counts; but by the direction of the learned Judge, a verdict was entered for the defendants on the point regarding the variance in the specification, with leave to the plaintiffs' counsel to move the Court above, to have a verdict entered for the plaintiffs. Sir Frederick Pollock having, on the part of the defendants, obtained a rule for a new trial, on the ground that the verdict was against the evidence, and that the last issue being material, entitled them to a general verdict, that rule was this day called on for argument.

* For an account of the Trial, see Vol. XVIII., Page 351, of the present Series of the London Journal of Arts.

The Court, after hearing the evidence taken on the trial read from the learned Judge's notes, expressed a strong opinion that the verdict was not against the evidence, and on that ground could not be disturbed. Lord Abinger and Barons Alderson and Rolfe were also of opinion that the specification was sufficient, and that the verdict should be entered for the plaintiffs on the last issue, whilst Baron Parke rather adhered to the opinion he had formed at the trial. After this intimation of the opinion of the majority of the Barons, the Court declined hearing the Solicitor-General and the other parties attending to show cause against the rule, but called on the counsel who had obtained it.

The Attorney-General felt that, after the strong opinion expressed by their Lordships, he could not successfully contend for a new trial. With respect to the validity of the specification, however, he thought that, as their Lordships were not agreed on that point, and the defendants could not have tendered a bill of exceptions at the trial; the learned Judge who presided, having decided the point for the defendants, he was now entitled to ask the Court to let that question be put upon the record, either by a bill of exceptions or by way of a special verdict.

The Court could not depart so far from its ordinary rules as to adopt the course suggested without consent, aud there was the less necessity for pursuing such a course in the present case, as the Lord Chancellor might direct another trial, if he were satisfied justice had not been done.

The rule for a new trial was then ordered to be discharged.

COURT OF COMMON PLEAS,

November 18th, 1841.

Walton v. Potter and Horsfall.

This was an action for the infringement of a patent, which was tried before the Lord Chief Justice Tindal, at the Middlesex Sittings after last Hilary Term, an account of which trial is reported in Vol. XVIII., p. 45, of our present Series.

The defendants pleaded, firstly,—that they were not guilty;

secondly,—that the plaintiff was not the true and first inventor; thirdly,—that the invention was not new, as regards the public use thereof at the time of granting the letters patent; fourthly,—it was not a new manufacture; fifthly,—it was of no public benefit or advantage; sixthly,—the alleged invention was not properly described in the specification; and lastly,—at the time of committing the several supposed grievances, a license was granted to them by the plaintiff. The Jury found a verdict for the plaintiff upon all the issues, and a rule *nisi* was obtained by Mr. Serjeant CHANNELL, in Easter Term last, to enter the verdict for the defendants instead, or for a new trial, or for an arrest of judgment upon the third issue.

The patent, as described by the plaintiff in his specification, consisted in an improved species of card for carding cotton, silk, wool, and other fibrous substances, and for raising the pile of woollen cloth, by the substitution of a base or back of caoutchouc for the leather which had been previously used; by which means an uniform elasticity was obtained, which nothing else would produce.* The plaintiff's patent was dated March 29th, 1834, and the success of the invention induced the defendants to take out a patent in April, 1839, which the plaintiff complained of as being a colourable imitation of his own—the base of the plaintiff's card consisting of a cut or "sliver" of caoutchouc attached to some non-elastic substance, while that of the defendants' was made by drawing the woven fabric, of which it was composed, several times through a vessel containing a solution of India-rubber varnish, until it had attained the proper consistency; after which, a coating of ochre and glue size was given; it was then submitted to pressure, which completed the manufacture of the back.†

Much conflicting testimony was brought forward at the trial upon the utility of the plaintiff's invention, but the main ground of defence was, that the invention itself was not new, but was, in fact, nothing more than an application of the principle con-

* See Vol. XVII., p. 363, of the present Series of the London Journal of Arts.

† For description of this Specification, see Vol. XVIII., p. 41, of the present Series.

tained in a patent granted to Mr. Hancock, in March, 1825, for a preparation which was to unite wool, cotton, hair, flax, and other fibrous substances, in such a manner as to render them impervious to wet; the preparation being a solution of caoutchouc in oil of turpentine, mixed up with certain proportions of black resin, size, and powdered pumice or whiting; the whole forming a viscous mass, which was to be applied to fibrous substances and render them a substitute for leather.

Sir Thomas Wilde and Mr. Serjeant Bompas showed cause against the rule, and Mr. Serjeant Channell was heard in support of it.—After which, the Lord Chief Justice delivered the following judgment:—

Chief Justice Tindal: "I shall say but little in this cause, because it is, in effect, an appeal from the direction I gave to the jury upon the trial of the cause.

"With respect to the first ground, the cause was debated at very considerable length, and with great ability, by the counsel on both sides; and I think there was scarcely a point which arose upon the evidence which was not submitted in its turn to the Jury, according to the particular view which the respective counsel entertained of it; and I must say, I see no reason whatever to be dissatisfied with the conclusion at which they arrived. They were first to say whether, upon the plea of not guilty, the mode which had been used by the defendants was virtually and substantially the same as that described in the specification; a mere matter of fact, upon which they had the evidence of the plaintiff, and the defendants' witnesses; and they arrived at the conclusion, that the defendants had borrowed their invention from that of the plaintiff's specification. Then on the next pleas, the questions that were specifically raised for their determination were, whether this was a new invention, or whether it was known before the time when the plaintiff obtained his patent; and they determined that, as far as the public use was concerned, it was new, and not known in the kingdom of England before the date of that patent. I see no reason, after they have exercised their judgment upon it, and had Hancock's patent fully explained to them, and arrived at that conclusion, why we should set it aside, and send it down to a new trial.

"There was only one other issue which is material, which was, whether sheet cards and top cards were useful or not, according to the mode described in the adaptation of the patent; and upon that they also found their verdict for the plaintiff, the evidence in that part being the actual user of sheet and top cards, and the trial of experiments, though perhaps since the action was brought, yet still bearing upon the question, the same subject matter, and producing the same results; and there being, therefore, on the part of the plaintiff, positive evidence that it would answer, and, on the part of the defendants, nothing but judgment and belief that it would not, why are we to set the verdict aside? Therefore, as far as that ground comes into consideration, I think the cause is not to be sent back to another jury for the purposes of a second trial. Then, was there any misdirection? I take the grounds of misdirection which have been pointed out in the course of the argument, to be these,—first,—that two certain questions, which, at the close of my summing up to the jury, the learned counsel for the defendants wished me to ask the specific opinion of the jury upon, I declined putting to them; and, secondly, that I ought to have told the jury, that, looking at the whole of the patent and the specification, this was not the subject matter of a patent, within the statute of James. With respect to the first point, it appears too, I think, almost to be admitted in argument, that there was no necessity that I should put to the jury any specific questions which suggested themselves to the minds of the counsel. If they were points which I had overlooked in the course of my summing up to the jury, it would be very well to remind me of them, and to request that they should be put more pointedly than they had been in the course of such statement of the evidence to the jury; but it is a very inconvenient thing indeed, if, after the cause has been left to the jury upon the specific issues raised upon the record, certain insulated questions should obtain specific answers, and come back to the court out of which the record proceeded. It may sometimes be very useful and necessary; in many cases where the jury might come to a decision upon a point upon two different grounds, distinct from each other; therefore, I cannot think, as at present

advised, that I did improperly, or indeed unwisely, in declining, at that period of the trial, to leave these points to the jury.

"I come now to the second ground, upon which it is contended that there was a misdirection. I am not prepared to say—on the contrary, I am ready to admit that if there was an issue raised upon this record which involved the validity of the patent, I was bound to give my opinion one way or the other to the jury—that it was a void or valid patent; but, looking at these issues, I do not see any one which raises the question whether this was, in the sense in which it has been argued before us, a manufacture within the statute of James, that is, in effect, whether the invention was one which in point of law a patent ought to be granted for; as, for instance, where it is a mere abstract principle not embodied at all, or not involving any combination or process to carry it into effect, or any other objection of that nature. The only one that comes nearest to it is the third issue, which is merely whether it is a new manufacture known in England, in the exercise and practice thereof, at the time the patent was granted; but that directs the mind of any person who looks at it, to a very different inquiry from that involving the question whether the invention is within the meaning of the statute of James, a manufacture for which a patent may be granted, but taking it for granted that it is a manufacture, and only raising the question whether, being a manufacture, it was in public use and exercise at the time the patent was granted or not; and, therefore, to leave that inquiry, and suddenly to decide upon the other in the course and progress of the trial, would be to mislead the party who had come into court to contest the question before the jury; therefore, I think, upon both these points, as a matter of evidence, or as a matter of direction to the jury, I should not have been warranted in raising or putting that objection to them.

"Then the last ground is—is this upon the record, so that error may be assigned, and that the court may be called upon to arrest the judgment? for, unless the court can be called upon to arrest the judgment, we have nothing to do but to let it pass in its ordinary course. I think, looking at the terms of this fourth plea, the question does not properly come before us. There is

an allegation in that plea, that the specification which was enrolled was sound; so stating it in *hæc verba.* That is only used as matter of inducement, upon which afterwards to state a new allegation, that top cards and sheet cards, within the meaning of that specification, are useless. That is the question raised upon the record; and after that has been raised, and the jury have found that issue in favour of the plaintiff, it does not appear to me that the defendant can afterwards turn round, and make that which was only inducement, and not issue, a substantive ground of allegation upon the record of the invalidity of the patent itself. Such appears to my mind at present to be the proper reasoning upon it; but there it is upon the record, if the parties, upon further consideration, should think me wrong. Therefore, upon the whole, I think the judgment must be given for the plaintiff."

Mr. Justice Coltman delivered the following judgment:—" It appears to me, that in this case there is no sufficient ground for a new trial.

" As to the first issue, which went to the jury upon the question of whether the defendants were guilty or not of an infringement, the main question of the argument upon that point has been this, as I understand it, that the jury were misled, and induced rather to consider that the question for their determination was, whether the manufactured article of Potter and Horsfall was an imitation of the manufactured article of Mr. Walton, rather than whether it was an infringement of his patent; and that was founded chiefly upon this,—that it was treated, as is alleged in the course of the argument on one side and the other, as if the use of the non-elastic linen at the back of the card was an essential part of the patent; and it is said that was not so—that the patent was merely for the simple application of caoutchouc as the fillet, and that the cotton or linen at the back of it is no part whatsoever of the patent of that which is claimed as the patent, but only a part of the manufactured article which is produced; but I confess I do not accede to that view of the patent, because the terms of the patent being,—I confine my claim of invention to the application and adaptation of caoutchouc as the fillet, in which the dents or teeth are to be set together, as above described,—that does appear to

me to be, not simply a claim to the use of caoatchouc, but to the adaptation of it to the reception of dents or teeth, by putting on the back of it a linen cloth, which, in the original manufacture, is proved to be an essential part of the patent; because, although the cloth may be removed afterwards, yet it is by means of having some stiff and permanent substratum of that nature that the dents are to be inserted into the caoutchouc, the caoutchouc of itself being a matter so elastic. Therefore there is something more than a simple application of caoutchouc to the manufacture of a card, and the inserting of the dents in the fillet,—so that it appears to me there is nothing in the application of the argument arising from the use of the linen at the back of the fillet, which should lead me to say the Jury have been misled, or induced to take a wrong view of this matter, when they found their verdict that the defendants were guilty of an infringement. As to the second plea, that the plaintiff was not the first inventor, certainly it seems the evidence is quite satisfactory, that if it was a new invention, he was the inventor of it. With regard also to the other question, that the patent does not apply to top cards and sheet cards, it appears to me that the Jury had good grounds for the verdict that they have found upon that point.

"It is said, also, in the last plea, the description in the patent is not sufficient.

"As to that, very little stress has been made in the argument; and I think, upon the whole, there is no ground for saying, that there is any difficulty in understanding this patent by a person of competent skill. Of course it cannot be expected that I should understand the parts of it in the way in which a person used to the work can; but, at the same time, I do not know that even an ordinary person, like myself, quite unacquainted with manufactures, would find any difficulty in understanding any part of this patent; it seems to me to be explained with sufficient distinction. Then it is said, there was a misdirection. Now, upon that point, the first is the not putting these two questions to the Jury. It appears to me, these questions were the natural foundation of arguments in the course of the cause, but they were not the issues to which the attention of

the Jury was to be directed; and they rather seem to have been suggested for the purpose of betraying the Jury into a sort of inconsistency in the verdict they should find, than questions really calculated to advance the fair trial of the cause.

"Now, to come to the last point in the case, the question of what is, or what is not, upon the record, upon that subject. I do not at all feel confident that this question is not upon the record; because it appears to me, that in substance the defendants in this case have pleaded a plea, which, if proved, is a good answer to the action, and have added to it some immaterial allegations, assuming that the specification is bad, because they set out the specification, and I am rather disposed to think that it appears upon the record, and that, if the specification is bad, this plea would raise this question.

"Then, though they have gone to trial upon an immaterial issue, I do not feel confident that the right course would be to give judgment against the plaintiff in this case; but it appears to me, that in this case the plea is not good, because I think the patent is a valid patent.

It is true that the invention is very simple in its nature; but, upon the best consideration I can give to this subject, though it is a very simple adaptation of caoutchouc as a fillet, still it is an adaptation of caoutchouc as a fillet, in a manner not practised before: a substance, indeed, well known before, but whose properties and qualities, for the purpose of being adapted for this particular purpose, had never been known or applied before; and therefore it was properly the subject of a patent; and, if it were properly the subject of a patent, then it becomes quite immaterial to see if a different conclusion is come to upon the subject of this specification, whether it does or does not arise upon the record.

"Under all these circumstances, it appears to me that there is no ground for either of these motions.

"The plaintiff has therefore established his right to the exclusive use of India-rubber backs for cards."

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th October to the* 17*th of November*, 1841, *inclusive.*

To Floride Heindrychx, of Fenchurch-street, in the City of Lon-London, engineer, for certain improvements in the construction and arrangement of fire-places and furnaces, applicable to various useful purposes.—Sealed 29th October.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the County of Middlesex, civil engineer, for certain improvements in the manufacture of fuel,—being a communication from a foreigner residing abroad.—Sealed 3rd November.

Lawrence Kortright, of Oak Hall, East Ham, in the county of Essex, Esq., for certain impovements in treating and preparing the substance commonly called whalebone, and the fins and such like other parts of whales, and rendering the same fit for various commercial and useful purposes,—being a communication from a foreigner residing abroad.—Sealed 3rd November.

Richard Laurence, of Sturtevant, for certain improvements in the manufacture of soap.—Sealed 18th November.

List of Patents

Granted for SCOTLAND, subsequent to October 22*nd*, 1841.

To Joseph Wright, of Carisbrook, Isle of Wight, mechanic, for improvements in apparatus used for dragging or skidding wheels of wheeled carriages.—Sealed 27th October.

Robert Logan, of Blackheath, Kent, for improvements in obtaining and preparing the fibres and other products of the cocoa-nut and its husk.—Sealed 27th October.

Joseph Clisild Daniell, of Tiverton Mills, near Bath, for improvements in the manufacture of manure, or composition to be used on land as manure.—Sealed 27th October.

Alfred Jeffray, now of Lloyd-street, Pentonville, London, for a new method of defending the sheathing of ships, and protecting their sides and bottoms.—Sealed 27th October.

William Neilson, builder, residing in Glasgow, and David Lyon, residing in Tradeston, of Glasgow, and Peter Mc Omie, engineer, residing there, for a mode or modes of, or an improvement or improvements in cutting, dressing, preparing and polishing stones, marble and other substances; and also in forming flat or rounded mouldings, and other figures thereon. —Sealed 29th October.

James Whitelaw, of Glasgow, and James Stirrat, of Paisley, for improvements in rotatory machines, to be worked by water.—Sealed 3rd November.

Martyn John Roberts, of Brynycaeran, Carmarthenshire, and William Borren, of Glasgow, for improvements in the process of dyeing various matters, whether the raw materials of wool, silk, flax, hemp, cotton, or other similar fibrous substances; or the same substances in any stage of manufacture, and in the preparation of pigments or painters' colours.—Sealed 10th November.

John Annes, of Plymouth, painter, for a new and improved method of making paint, from materials not before used for that purpose.—Sealed 12th November.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles.—Sealed 17th November.

George Bent Ollivant and Adam Howard, of Manchester, millwrights, for certain improvements in cylindrical printing machines, for printing calicoes and other fabrics, and the apparatus connected therewith, which is also applicable to other useful purposes.—Sealed 17th November.

John Steward, of Wolverhampton, for improvements in the construction of piano-fortes.—Sealed 22nd November.

New Patents

SEALED IN ENGLAND.

1841.

To William Golden, of Huddersfield, gun-maker, and John Hanson, of the same place, lead pipe manufacturer, for certain improvements in fire-arms, and in the bullets and other projectiles to be used therewith. — Sealed 2nd November—6 months for inrolment.

Thomas Macauley, of Curtain-road, upholsterer, for certain improvements in bed-steps, which are convertible into other useful forms or articles of furniture.—Sealed 2nd November—6 months for inrolment.

Robert Logan, of Blackheath, Esq., for improvements in obtaining and preparing the fibres and other products of the cocoanut and its husk.—Sealed 2nd November—6 months for inrolment.

Robert Holt, of Manchester, cotton spinner, and Robinson Jackson, of the same place, engineer, for certain improvements in the machinery or apparatus for the production of rotary motion for obtaining mechanical power; which said improvements are also applicable for raising and impelling fluids.—Sealed 2nd November—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Gent., for improvements in machinery used in the manufacture of bobbin net or twist lace,—being a communication.—Sealed 2nd November—6 months for inrolment.

Henry Kirk, of Tavistock-square, Gent., for a substitute for ice for skating and sliding purposes.—Sealed 2nd November—6 months for inrolment.

William Brunton, of Neath, Glamorgan, engineer, for an improved method or means of dressing ores, and separating metals or minerals from other substances.—Sealed 2nd November—6 months for inrolment.

Jeremiah Bynner, of Birmingham, lamp-maker, for improvements in gas burners,—Sealed 2nd November—6 months for inrolment.

Edward Robert Simmons, of Croydon, Esq., for improvements in apparatus for preventing splashing in walking.—Sealed 2nd November—6 months for inrolment.

Henry King, of Webber-row, Westminster-road, engineer, for certain improvements in steam-engines and boilers.—Sealed 4th November—6 months for inrolment.

Jules Lejeune, of North-place, Cumberland-market, manufacturing chemist, for a means of condensing and collecting the sulphurous and metallic vapours, which are evolved in the treatment, by heat, of all kinds of ores.—Sealed 4th November—6 months for inrolment.

Job Cutler, of Lady Pool lane, Birmingham, Gent., for improvements in the construction of the tubular flues of steam boilers. —Sealed 6th November—6 months for inrolment.

John Carr, of North Shields, earthenware manufacturer, and Aaron Ryles, of the same place, agent, for an improved mode of operating in certain processes for ornamenting glass.—Sealed 9th November—6 months for inrolment.

Jesse Ross, of Leicester, manufacturer, for a new wool-combing apparatus.—Sealed 9th November—6 months for inrolment.

Heny Davies, of Birmingham, engineer, for certain improved machinery, suitable for applying power to communicate locomotion to bodies requiring to be moved on land or water.—Sealed 9th November—6 months for inrolment.

Jesse Smith, of Wolverhampton, lock maker, for improvements in the construction of locks and latches, applicable for doors and other purposes.—Sealed 9th November—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in the production of ammonia,—being a communication.—Sealed 9th November—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for

improvements in the manufacture of candles,—being partly a communication.—Sealed 9th November—6 months for inrolment.

John Garnett, of Liverpool, merchant, and Joseph Williams, of the same place, manufacturing chemist, for an improved method of manufacturing salt from brine.—Sealed 9th November—6 months for inrolment.

John Burnell, the Younger, of Whitechapel, manufacturer, for improvements in the manufacture of leaves or sheets of horn, commonly called lantern leaves, and in the construction of horn lanterns.—Sealed 9th November—6 months for inrolment.

John Edwards, of Cowcross-street, Gent., for an improved strap or band for driving machinery, and for other purposes.—Sealed 9th November—6 months for inrolment.

James Stewart, of Osnaburgh-street, St. Pancras, Piano-forte-maker, for certain improvements in the action of horizontal piano-fortes.—Sealed 11th November—6 months for inrolment.

George Allarton, of West Bromwich, surgeon, for certain improvements in the method of balling and blooming iron.—Sealed 11th November—6 months for inrolment.

John Peter Booth, of Hatton Garden, feather merchant, for certain improvements in the manufacture of a substance or compound fabric, which will be applicable to the making of quilts, coverlets, and wadding, for purposes of clothing or furniture.—Sealed 11th November—6 months for inrolment.

Isaac Davis, of New Bond-street, optician, for improvements in the manufacture of sealing wax, which compounds are applicable to other useful purposes.—Sealed 11th November—6 months for inrolment.

Edward Joseph François Duclos de Boussois, of Clyne Wood Metallurgical Works, Swansea, Glamorgan, engineer, for improvements in the manufacture of copper.—Sealed 11th November—6 months for inrolment.

John Onions, of Field-lane, Darlaston, Stafford, engineer, for improvements in the manufacture of certain descriptions of nails,

screws, and chains.—Sealed 11th November—6 months for inrolment.

James Young, of Newton-le-Willows, Lancaster, chemist, for certain improvements in the manufacture of ammonia, and the salts of ammonia; and in apparatus for combining ammonia, carbonic acid, and other gases, with liquids.—Sealed 11th November—6 months for inrolment.

Isaac Dodds, of Sheffield, engineer, for certain improvements in the modes or methods of supplying gas, for the purposes of illuminating towns and other places.—Sealed 13th November—6 months for inrolment.

Henry Mortimer, of Frith-street, Soho, Gent., for improvements in covering ways and surfaces, and in constructing arches.—Sealed 16th November—6 months for inrolment.

John Squire, of Albany Place, Regent's Park, engineer, for certain improvements in the construction of steam boilers or generators.—Sealed 16th November—6 months for inrolment.

Robert Stirling Newall, of Gateshead, Durham, wire rope manufacturer, for improvements in the manufacture of flat bands.—Sealed 16th November—6 months for inrolment.

John Venables, of Burslem, Stafford, manufacturer, and John Tunnicliff, of the same place, bricklayer, for a new and improved method of building and constructing ovens, used by potters and china manufacturers, in the firing of their wares.—Sealed 20th November—2 months for inrolment.

William Manwaring, of York-street, Lambeth, engineer, for certain improvements in the manufacture of sugar.—Sealed 23rd November—6 months for inrolment.

Richard Gurney, of Treevinnion House, Cornwall, Esq., for a method of cutting wood, and incrustating the same, in order to present a sure footing for horses, and other purposes.—Sealed 25th November—6 months for inrolment.

CELESTIAL PHENOMENA FOR DECEMBER, 1841.

D.	H.	M.	
1			Clock after the sun 10m. 42s.
	—		☽ rises 6h. 40m. A.
	—		☽ passes mer. 2h. 4m. M.
	—		☽ sets 10h. 39m. M.
	1		☽ in Perigee.
	21	25	♀ in conj. with Juno, diff. of dec. 6. 37. N.
2			Occul o^2 Cancri im. 15h. 46m. em. 16h. 29m.
3	14	11	☿ greatest elong. 20. 30. W.
5			Clock after the sun 9m. 6s.
	—		☽ rises Morn.
	—		☽ passes mer. 5h. 44m. M.
	—		☽ sets 0h. 11m. A.
		16	☽ in □ or last quarter.
8			Ceres stationary
10			Clock after the sun, 6m. 54s.
	—		☽ rises 5h. 40m. M.
	—		☽ passes mer. 9h. 45m. M.
	—		☽ sets 1h. 43m. A.
10	18	17	♀ in conj. with the ☽ diff. of dec. 5. 43. N.
	20	35	☿ in conj. with the ☽ diff. of dec. 6. 8. N.
11	9	36	Vesta stationary
12	3	12	Her. in □ with the ☉
	9	35	Ecliptic conj. or ● new moon.
13	1	35	♃ in conj. with the ☽ diff. of dec. 2. 51. N.
	10	58	♄ in conj. with the ☽ diff. of dec. 2. 59. N.
15			Clock after the sun, 4m. 32s.
	—		☽ rises 10h. 6m. M.
	—		☽ passes mer. 2h. 6m. A.
	—		☽ sets 6h. 12m. A.
	—		Mercury R.A. 16h. 16m. dec. 20. 16. S.
	—		Venus R. A. 16h. 14m. dec. 20. 20. S.
	—		Mars R. A. 21h. 3m. dec. 18. 10. S.
	—		Vesta R. A. 1h. 31m. dec. 0. 38. N.
	—		Juno R. A. 15h. 19m. dec. 9. 57. S.
	—		Pallas R. A. 22h. 39m. dec. 10. 36. S.
	—		Ceres R. A. 1h. 4m. dec. 3. 54. S.
	—		Jupiter R. A. 17h. 57m. dec. 23. 18. S.
	—		Saturn R. A. 18h. 17m. dec. 22. 43. S.
	—		Georg. R. A. 23h. 26m. dec. 4. 27. S.
	—		Mercury passes mer. 22h. 42m.
	—		Venus passes mer. 22h. 35m.
	—		Mars passes mer. 3h. 27m.
	—		Jupiter passes mer. 0h. 21m.
	—		Saturn passes mer. 0h. 41m.
	—		Georg. passes mer. 5h. 49m.
16	22	9	♂ in conj. with the ☽ diff. of dec. 2. 43. S.
17	2		☽ in Apogee.
18			Occul ρ Aquarii, im. 9h. 8m. em. 10h. 9m.
20			Occul λ Piscium, im. 5h. 42m. em. 6h. 19m.
	—		Clock after the sun, 2m. 3s.
	—		☽ rises, 11h. 27m. M.
	—		☽ passes mer. 5h. 37m. A.
	—		☽ sets Morn.
	2	8	Her. in conj. with ☽ diff. of dec. 5. 21. S.
21	2	49	☽ in □ or first quarter.
21	10	56	☉ enters Capricornus,—Winter commences
22	14	20	♃ in conj. with the ☉
23	5	30	☿ in the descending node
25			Clock before the sun, 0m. 26s.
	—		☽ rises, 1h. 5m. A.
	—		☽ passes mer. 9h. 38m. A.
	—		☽ sets, 5h. 4m.
25	19	28	♄ in conj. with the ☉
28	6	35	Ecliptic oppo. or ○ full moon
29	3	0	☽ in Perigee
30	15	26	☉ in Perigee
31			Occul. x Leonis, im. 12h. 4m. em. 13h. 10m.

The Satellites of Jupiter are not visible this Month, Jupiter being too near to the Sun.

J. LEWTHWAITE, Rotherhithe.

THE

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No. CXXI.

Recent Patents.

To THE RIGHT HONORABLE FRANCIS EARL OF DUCIE, *of Woodchester Park, in the county of Gloucester,* RICHARD CLYBURN, *of Uley, engineer, and* EDWIN BUDDING, *engineer, of Dursley, both in the same county, for their invention of certain improvements in machinery for cutting vegetable and other substances.*— [Sealed 15th October, 1840.]

THIS invention of certain improvements in machinery for cutting vegetable and other substances, consists, firstly, in the application of a peculiarly formed rotary knife-edged tool or cutter to the purposes of cutting, paring, or shaving certain substances hereinafter mentioned; such rotary tool or cutter consisting of a blade or blades, coiled spirally, either upon a cylinder or upon rims, hoops, discs, or wheels; each blade being so coiled as to form, at all points of its width or transverse section, an angle with the axis or centre line of the coil so formed, in order that a sharp cutting

edge may be produced, by removing the outside of the thickness of such blades in an angular direction, and admitting of a ready mode of sharpening the same, without the necessity of removing or detaching the blades from the axis on which they revolve, or the axis itself, from the machine.

Secondly,—In supporting such blades or cutters, throughout their whole length, upon a cylinder, suitably formed, when used for the purpose only of cutting hay, straw, or other such substances, intended to be used as food for cattle or other animals.

Thirdly,—In the employment of a spiral or coiled blade or cutter, for the purpose of cutting turnips, mangel wurzel, or other roots, into slices or other pieces, to be used as food for cattle, sheep, or other animals.

Fourthly,—In a mode of changing the speed of the feeding rollers, in what are commonly called chaff-cutting machines, in order that the hay, straw, or other matter, under operation, may be cut into different lengths, if required.

And lastly,—In giving to spiral or coiled rotary blades or cutters, a notched or serrated edge, resembling a sickle or finely-cut saw; such edge being capable of retaining that property as it is ground away by the process of sharpening.

In Plate XV., at fig. 1, is shewn one construction of cutter, the application of which constitutes the first head of the invention. The cylinder or axle, in this instance, is of iron, having screw-like or spiral grooves or channels *b, b, b,* formed thereon. One side of these channels are inclined planes, forming an angle with the axis and periphery of the cylinder. Upon these inclined planes or sides of the grooves, the knives or blades *c, c, c,* are placed or wound, in a spiral direction, and attached thereto by screws, rivets, or other means; *d, d,* is the axis, upon which the cylinder with its blades, revolves, and is keyed to the arms or discs *e, e,* at each end of the cylinder.

In some cases, instead of the double coil of blades here shewn, it may be desirable to use a cutter, having the blades affixed thereon, as a right and left-handed screw, the opposite angles meeting in the centre, as shewn at fig. 2; in which figure, the cutters (revolving in the direction of the arrow) are so arranged as to draw the article, under operation, towards the centre of the machine, which is desirable when cutting fibrous vegetable matters; but, under some circumstances, such as in shaving leather, the cutters are reversed, and they will then have a tendency to force the material operated upon, towards each end of the cylinder. The method of mounting the spiral blades may be effected in various ways.

The first application described, of the improved tool or cutter, is to the shaving or paring of leather, so as to bring it to a uniform thickness.

Figs. 3 and 4, represent a machine, which may be employed for shaving or paring hides or skins, or strips of leather intended to be used for the manufacture of wire cards, or other purposes. Fig. 3, is a front elevation, and fig. 4, a transverse vertical section, taken through the middle of the machine, looking towards the left-hand end. *a, a, a,* is the frame-work of the machine, connected together by cross-bars, as shewn in the drawings. On the top of this frame-work is mounted the rotary cutter A, turning in proper bearings at each end, and is driven by a strap or endless band passing over the pulley *b*, or by other means; *c, c,* is a cylindrical bed or roller, over which the leather passes, it being tightly distended upon its surface, in order that, as it passes the edges of the cutting tool, all superfluous parts may be shaved or pared off. The bed *c, c,* should be of copper, iron, or other firm substance, coated with copper or other material, which will not discolour the articles under operation.

The revolving bed is mounted, at its ends, upon the extremities of short levers *d*, *d*, which have their fulcrums, at the reverse ends, on pins or studs, affixed to the framework of the machine; *e*, *e*, are cams or excentrics, mounted upon the longitudinal shaft *f*, *f*, their peripheries acting against the under sides of the levers *d*, *d*, or some part connected therewith; *g*, is a lever or handle, affixed to one end of the shaft *f*; by which means, the shaft can be turned a portion of a revolution, and consequently with it the cams or excentrics *e*, *e*, whereby the roller or bed *c*, *c*, will be brought nearer to, or further from, the rotary cutter, as required, to regulate the thickness of the leather or depth of the cut of the blade into the material; *h*, *h*, is a slot, having its radius from the centre of the shaft *f*, *f*; in which slot there is a sliding pin *i*, provided on one side with a collar *k*, and on the other with a screw-nut *l*; by which means, both it and the lever *g*, may be retained in any required position in the slot *h*. A pin *m*, (see the detached fig. 5,) is affixed to a spring *n*, mounted upon the lever handle *g*; which pin passes through an aperture in the handle *g*, and is pressed by the spring *n*, into a recess, formed in the collar *k*, of the sliding pin *i*; by means of which, the lever is held or retained.

It will be evident, from this arrangement of the parts, that the materials under operation may be shaved or pared to any required uniform thickness; for by moving the pin *i*, higher up or lower in the slot *h*, the lever handle being made to keep its relative position, will cause the shaft *f*, *f*, and also the excentrics *e*, *e*, to be turned a portion of a revolution, and thereby bring the bed *c*, to the required distance from the rotatory cutter.

A roller *o*, *o*, turning in proper bearings, has one end of the skin or hide, or strip of leather, attached to it, upon which the leather is to be wound, after it has passed through

the machine. The means by which the attachment of the leather is made, will be seen in the section.

It will be perceived, that there is an indentation or recess formed in the roller *o*, and in this is placed the rod *p*, which has the hide or skin wound around it, the rod being kept in its position, when in action, by means of the hoops of metal *q*, *q*, so that the roller *o*, when revolving, keeps the upper lap of the skin or hide tightly distended upon the lower one, thereby holding it tight in the required position. *r*, *r*, is a spring blade, extending throughout the length of the bed *c*, which is for the purpose of pressing upon the material under operation, in order that it may be evenly distended when presented to the action of the blades of the rotatory cutter. This spring blade is attached to the bar *s*, *s*, fixed to the frame-work, and is capable of adjustment, so as to give more or less tension to the spring blade, by set screws, as shewn in the drawing.

The mode by which motion is given to the drawing roller *o*, will be seen by reference to figs. 3 and 4. *t*, is a worm, mounted on one end of the axis of the rotatory cutter A, which worm takes into the wheel *u*, mounted on the short shaft *v*; and on this shaft there is a bevil pinion *w*, taking into another bevil wheel *x*, the latter wheel being mounted upon the axis of the roller *o*; and by these means, it will be caused to revolve slowly, and take up or draw the skin, hide, strip of leather, or other material, through the machine. A clutch *y*, affords the means of giving rotation to the roller at pleasure; and *z*, is a scraper, turning on centres, affixed to the levers *d*, *d*, for the purpose of removing any dirt or fibrous particles adhering to the bed *c*, *c*.

The operations of the machine are as follow:—The workman first withdraws the pin *m*, from the recess in the collar *k*, and forces the handle *g*, upwards into the position shewn by dotted lines, in fig. 4; by which means, the cams *e*, *e*,

are turned downwards, and the bed *c, c,* consequently falling into the position shewn by dotted lines in the same figure; the skin, hide, or strip of leather, or material, is then passed by the workman through the machine under the rotatory cutter A, and one end of it is attached, by the means before described, to the roller *o*. The handle *g*, is then brought down with the pin *m*, into contact with the collar *k*; the sides of which, being formed as inclined planes, will cause it to recede, and allow the handle to pass further down, until the pin *m*, arrives opposite the recess formed in the collar *k*, when it will be forced into that recess by the spring *w*, and the handle will become fixed. The bed *c, c*, being now brought up to the required position, by means of the cams *e*, motion is to be communicated to the driving pulley *b*, and to the roller *o*: the hide or other material will be gradually drawn through the machine, and the upper surface be shaved or pared as it passes over the bed *c, c*. As soon as the end of the hide, under operation, has passed through the machine, the driving strap is thrown on to the loose pulley *b**, by any ordinary means; the roller *o, o*, is again thrown out of gear, and the handle *g*, raised, the bed *c*, falling down as before. The hide is then reversed, end for end, and again passed through the machine;—that end which has been operated upon by the rotatory cutter, being this time affixed to the roller *o*. By this operation, the whole length of the hide or skin will be pared or shaved to the required thickness.

Figs. 6 and 7, represent a machine, with the improved construction of cutting tool applied thereto, designed to cut or shave a whole hide or skin; but as it will sometimes occur, that the entire extent or surface of the hide cannot be stretched evenly over the bed, on account of certain parts, (by curriers usually called "bags,") this machine is arranged suitably for operating upon a portion only of the

whole surface of skin or hide at one time. Fig. 6, is a front elevation of the machine; and fig. 7, a vertical section, taken transversely. *a, a, a,* is the frame-work of the machine; A, the rotary cutter. In this instance, it is mounted in bearings, suspended from the top bar of the frame-work, and is driven by a strap, passing over the pulley *b*;—*c, c,* is the bed, over which the leather passes, and upon which that part of the material under operation, is distended.

The bed, in this machime, is mounted upon sliding pieces *d, d,* capable of moving up and down between the parallel guides *d*, d**. Cams *e, e,* mounted upon the shaft *f, f,* act upon the sliding pieces *d, d,*—the handle *g,* being placed in different positions, as described with reference to the former machine; *o, o,* is the roller or drum, on which the material is wound, as it proceeds from the cutter, and in this machine is of larger diameter: and instead of the rod *p,* as in the former instance, a pair of chaps or holders *p, p,* are used for drawing the material through the machine, there being an opening or recess *q, q,* in the periphery of the drum *o, o,* into which they pass, in order to present an even surface for the material to be wound upon. The spring blade, for pressing the leather evenly upon the bed, is represented at *r, r.*

The mode by which motion is given to the drum *o, o,* is as follows:—*t,* is a worm, mounted on the end of the shaft of the rotatory cutter A, taking into a worm-wheel *u,* mounted on the shaft *v, v*; on which shaft there is another worm *w,* taking into the worm-wheel *x,* on the axis of the drum *o.*

The mode of operating with this machine, is as follows:—The skin, hide, or material, intended to be shaved or pared, is first folded over, leaving a single thickness a little longer than the width of the rotatory cutter; it is then placed upon the table *t,* in the front of the machine. The bed

c, c, is then lowered, as before described, and the material passed under the rotatory cutter, as shewn at 2, 2, fig. 6, and secured to the clamp *p, p,* when the bed, being again raised, and motion communicated to the drum *o,* through the train of gear, it will be drawn onwards, and this part of the material shaved or cut throughout its whole length; the bed and wheels which drive the drum, are then thrown out of gear, and the bed is again lowered, when the skin or hide is pulled sideways, (the holding chaps *p,* being opened,) bringing another width, or part of the same, under the action of the rotatory cutter; and so on, until the whole width of the material has been operated upon. 3, 3, is a board, extending along the back of the machine, for the purpose of supporting the material previously to its arriving on to the drum. In this arrangement and construction of machine, there will be no occasion for reversing the skin or hide, or material, end for end, and passing it again through the machine, as the chaps or clamp *p, p,* may be brought sufficiently close to the cutter to effect the shaving throughout its length.

Another arrangement and construction of machine, for effecting this purpose, is shewn at figs. 8 and 9; the difference consisting in using the same length of machine, but dispensing with the necessity of folding the skin or hide, or material. Fig. 8, is an end view, and fig. 9, a longitudinal vertical section; in which figures, the same letters of reference refer to similar parts in this and the two former machines. 4, 4, are wooden troughs, supported at their ends by arms 5, 5, having rollers running upon a rail, affixed to the floor. These troughs also carry rails 6, 6, affixed to the longitudinal beam 7. These rails bear upon rollers 8, 8, supported by the frame-work of the machine. 9, 9, are racks, attached to the under sides of the beams 7, 7; which racks are operated upon by pinions 10, 10,

affixed to a cross shaft, turning in bearings, attached to the sliding piece *d, d*, of the bed *c*, and receive rotatory motion by the following means:—

On the axis of the rotatory cutter A, is a pulley 11, driving another pulley 12, on the cross shaft 13; and this shaft, by means of a pair of bevil pinions 14, actuates the worm 15, taking into the worm-wheel 16, upon the axis of the pinion 10; by these means they are caused to revolve, and move the racks 9, 9, and, consequently, the troughs 4, 4, with a slow progressive motion.

The bed, in this instance, is not constructed as a roller, but as a hooked or crutch piece; and the arrangement for raising and falling it, are nearly the same as in the former machine; the only difference being, that the pieces *d, d*, which carry it, are guided by pins, which run in slots formed therein.

The bed being lowered, the hide or skin, or material to be operated upon, is placed in one of the troughs 4, and passed under the rotary cutter; the end is then secured by the chaps or clamps *p, p*; when the bed being raised, and with it the pinions 10, 10, motion will be communicated to the troughs, as before described; and the material being shaved or pared in its progress to the required thickness, the bed is then again lowered, which will bring the pinions 10, 10, from their connection with the racks 9, 9, and arrest the progress of the troughs 4, 4*; when they, with the material, are moved back again, and the material under operation drawn transversely as before, so as to present a fresh width or portion for the action of the cutter; the part just finished, hanging in the trough 4*, as shewn in fig. 8, the bed being raised, and with it the pinions 10, into the racks 9, 9, the same operation will take place, and so on, until the whole width of the material is operated upon.

The other applications of this part of the invention, re-

late to the cutting of tobacco, sugar canes, dye woods, and cork; but, as the construction of machines for these purposes, to which the novel or particularly formed tool or cutter may be applied, form no part of the invention, and as the arrangement and construction may be varied to a great extent, the patentees have not thought it necessary to shew drawings of such machinery.

The second part of this invention, refers to the application, use, or adaptation of the novel or improved rotary tool or cutter, where the cutting edges or blades are supported throughout their whole length, to machines or engines, for cutting hay, straw, and other such matters, into chaff.

At fig. 10, is shewn this application of the improved tool to one construction of chaff-cutting machine; to the actuating parts of which, however, no claim is made, as they may be the same as shewn in the drawings, or those used in ordinary chaff-cutting machines.

The third head of the invention, viz., the improved arrangement and construction of coiled or spirally-formed cutter or tool, for cutting turnips or other roots, is shewn at figs. 11, 12, 13, 14, 15, and 16.

Fig. 11, is a plan view of the improved cutter, as applied to cutting turnips or other roots into slices; fig. 12, is a horizontal section of the same; and fig. 13, is an end view. The cylinder *a, a,* (as it may be termed,) on which the knives *b, b,* are supported, has coiled or spiral channels *c, c,* formed through its surface or periphery, opening into the interior of the cylinder; through which channels, the slices of turnips or other roots pass, as they are cut or shaved off by the rotation of the cutter.

The cylinder shewn in the drawing, is supposed to be about 15 inches long; and there are two spiral blades applied thereto, each one coiling but one-half of the distance

round the cylinder; by which arrangement, a sufficient space is obtained between the two knives, to permit the roots to come into contact with their edges, so as to be cut.

It will be perceived, that the section of the cylinder consists of two frustrums of cones; the two ends of which are formed in the direction of the spiral channels *c, c,*—the larger diameter of the frustrum being that on which the knives are placed, and which forms one side of the spiral channel; and the smaller diameter being that which forms the other side of the spiral channels; the knives will, therefore, at all parts of their spiral curve, present a projecting edge; which projecting edge, acting against the turnips or other roots, will cut off or remove slices therefrom, the thickness of which will be determined by the difference in diameter between the two spiral ends of the frustrums of the cones.

The spiral channels *c, c,* do not extend throughout the whole length of the cylinder, but terminate at the point *d, d,* there being a short piece left, at each end, in order to keep the parts of the cylinder united. The cutter, formed as above described, is mounted upon an axis, passing through bosses, which carry arms *e, e,* attached to the cylinder, as shewn in the drawing.

Fig. 14, is a section, shewing the improved turnip-cutter, mounted in its frame-work; *f, f,* is the hopper, into which the turnips or other roots, intended to be sliced, are placed. The pieces, as they are separated, falling through the channels *c, c,* into the interior of the cylinder, from whence thy fall into the receptacle placed to receive them.

Figs. 15 and 16, shew the improved turnip-cutter, arranged so as to cut the turnips or other roots into square or oblong pieces. The construction of the cylinder *a, a,* and knives *b, b,* are essentially the same as that already described; but in this case, are applied a series of knives

g, g, at right angles, or nearly so, to the axis of the cylinder. The mode by which these knives are attached, will be seen by reference to fig. 15; it will there be perceived, that the lower portions of the cylinder, which form one side of the spiral channels, are carried underneath the knives *b, b,* as at *h, h.* In these parts *h, h,* are formed mortices, through which the knives *g, g,* pass; and when they are brought flush with the spiral blades *b, b,* they are kept in their position by means of keys, or in any other convenient manner, so as to be readily removed, if required.

The fourth head of the invention is shewn at fig. 17. Upon the axis *a, a,* of the rotary cutter, are mounted the two worms *b, b**; which worms are formed upon the collar *c, c,* running loosely upon the axle *a, a*; *d,* is a worm-wheel, mounted upon a short shaft *e*; which shaft, at its other end, carries the bevil pinion *f,* taking into another bevil pinion *g,* mounted upon the axle *h,* of the under feeding roller. The worm *b,* is shewn in the drawing, in gear with the worm-wheel *d*; and motion being given to the rotary cutter A, by the winch handle *i,* or in any other manner, the feed-rollers will be caused to revolve, and deliver a given quantity of vegetable matter to the action of the rotary cutter; but should it be desired to obtain a faster feed, in order to cut the chaff of greater lengths, the screw *k,* is loosened, and the collar, on which the worms are formed, is slidden towards the framing of the machine, until it arrives in contact with the stop *l,* when the double-threaded screw *b*,* will be in gear with the worm-wheel *d.* The screw *k,* being again tightened, and motion communicated to the machine, the feed-rollers will revolve with twice the speed, and consequently chaff will be produced of a different length.

The fifth and last head of the invention, viz.—that of giving to spiral blades, used for cutting vegetable and other

matters, a saw edge, is shewn at figs. 18 and 19. Fig. 18, is a plan view of the under side of a portion of a spiral cutter, with the improvements; fig. 19, is an edge view of the same. It will be perceived, by referring to these figures, that the under surface is cut or indented, in one direction, after the manner of what are generally known as "float-cut" files; and that, consequently, the edges thereof, as they are ground, will be serrated, or resemble a finely-cut saw or sickle edge.

The patentees, in conclusion, state that what they claim, as their invention is, "First,—the application and use of the peculiarly formed knife or edged tool, hereinbefore described, to the purposes of cutting or operating upon leather, turnips, mangel wurzel, and other roots, as well as sugar cane, tanners' bark, dye woods, tobacco, and cork; such knife or edge tool, consisting of a spiral blade or blades, or a portion or portions of the same, set at an angle, in a transverse direction to the axis upon which it or they revolve.

"Secondly,—The application and use of such blades, knives, or cutting edges, as are supported throughout their whole length, when applied only to machines for cutting hay or straw, &c., into chaff.

"Thirdly,—The employment of a spiral blade or cutter, for the purpose of cutting turnips, mangel wurzel, or other roots, as food for cattle, as hereinbefore stated and described.

"Fourthly,—The mode hereinbefore described, of changing the speed of feed-rollers in chaff-cutting machines.

"And lastly,—In giving to spiral or coiled blades or cutters, used for cutting vegetable or other matters, a saw, sickle-like, or serrated edge, as above described."—[*Inrolled in the Petty Bag Office, April,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To Richard Edmunds, *of Banbury, in the county of Oxford, Gent., for certain improvements in machines or apparatus for preparing and drilling land, and for depositing seeds or manure therein.*—[Sealed 22nd October, 1840.]

This invention of improvements in machines for preparing and drilling land, and for depositing seeds or manure therein, applies, in the first instance, to that class of machines or agricultural implements called "pressers," intended to produce long angular furrows or indentations in the land (by means of wheels, having angular-shaped peripheries) after it has been ploughed, harrowed, or otherwise prepared for sowing; and which description of implements are used either for "broad-cast" or "drill-sowing;"—the angular sides of the indentation made in the land, produced by the shape of the wheels, allowing the seeds, when sown broad-cast, to fall into the bottom of the groove, which is then to be covered over by slight harrows or other means; by this means, the plant appears, when sprung up above the ground, in regular rows, as if it had been drill-sown.

This description of implement is also used to prepare the land for the after operation of the drilling machines, by which the seed or manure, one or both, is deposited immediately into the grooves, by means of guides or conductors. The improvements, in this instance, consist in mounting or placing the presser-wheels upon different axles; by which means, they are enabled to rise or fall, independently of each other, according to the resistance they have to overcome on the ground; and at the same time, an opportunity is given of weighting the presser-wheels or rollers, to any required degree, according to the nature or state of the soil, or depth of groove desired to be formed.

Another improvement, is making cylindrical pressers or rollers, consisting of a series of wheels, with plain peripheries, revolving separately; which, acting upon the land, or rolling over it, compresses the same to a certain degree, and produces a more advantageous result than one solid roller or cylinder would do.

The second part of the improvements consist in improved arrangements of apparatus, for regulating the supply of corn or seeds of any description, or manure, (such as bone-dust, ground bones, coal-ashes, saturated with blubber or fish oil, or any other such kind or description of manures, used in farming,) to the conductors or depositors of drilling machines. And the improvements, under this head, also apply to the construction of "hand-drilling machines."

The drilling apparatus may be used either in conjunction with the improved construction of presser; or with the ordinary presser machine, or be applied in conjunction with an ordinary drilling machine, having a coulter going before the depositors, to produce the necessary grooves in the land to receive the seed; which, in either instance, is covered over with the surrounding earth, by means of scrapers, rollers, or any other means.

In Plate XV., fig. 1, represents a side view of the improved presser; and fig. 2, a front view. The frame-work and shafts are shewn at *a, a,* and the running wheels at *b, b.* The axles of these wheels are formed on the end of a metal bar *c, c,* (see fig. 2.) The pressers *d, d,* have angular-shaped peripheries, and are separately mounted in bearings, at the end of forked levers *e, e,* jointed to the horizontal bar *c, c,* at *f, f.* Metal scrapers *g, g,* are fixed on to the forked levers *e, e,* for the purpose of clearing or scraping off anything which the pressing rollers might otherwise carry round with them.

Fig. 3, a side view of another machine, constructed on

the same principle; the only difference being, that the running-wheels are mounted on axles, by the side of, and in a line with, the pressing rollers; which, if thought desirable, may be weighted, as shewn at fig. 4.

Fig. 5, is an end, and fig. 6, a plan view of a hand-drilling machine. *h*, *h*, is a hopper-box or other receptacle for containing the grain to be deposited in the earth; and *i*, *i*, *i*, are apertures, through which the grain escapes. The size of these apertures, and, consequently, the quantity of grain that passes through them, is regulated by means of a metal plate *j*, *j*, having holes made in it to correspond to the apertures *i*, *i*, of the hopper. This metal plate slides in grooves, formed by studs or projections *k*, *k*, attached to the hopper, and to one end of the metal plate, is connected a screw *m*, passing through an ear or lug, and secured by a collar, on its end. This screw turns in a nut *n*, fixed to the hopper *h*, *h*; and when the screw *m*, is turned, the metal plate *j*, *j*, is moved either backward or forward, and all the apertures, through which the seed escapes, are increased or diminished in size, simultaneously.

The plan view of this machine, fig. 6, shews the manner in which a man is enabled to guide it, without the assistance of sticks, placed at convenient distances, as is the ordinary course pursued when machines of this description are employed for sowing grain, &c. *o*, and *p*, are rods, by means of which, the apparatus is propelled forward; and, by connecting one of these rods to one end of the machine, just behind the wheel, and at right angles to the axle thereof, and the other rod at the other end of the machine, about the angle of forty-five degrees to the first, the driver is enabled to propel the machine, and guide it in its proper course, by looking at the wheel that is before him, and keeping it in the furrow. The rods *o*, and *p*, are jointed to the frame-work of the machine, and may be moved into

the position shewn by dots in the drawing, by taking out the pin *q*, and attaching the handle *r*, to the end of the lever *p*, when such alteration may be considered necessary.

Fig. 7, represents a back view of another machine, for drilling grain; fig. 8, is a cross sectional view of the same. The hopper is shewn at *h*, *h*. The seed passes out through an aperture *i*, made in the hopper, (see fig. 8,) and is taken up in small quantities by the ratchet wheel *s*, which, as it revolves, drops the seed into the funnels *t*, *t*, through which it descends to the earth.

The quantity of seed that is taken up by the notched wheel *s*, is regulated by means of moveable side pieces *u*, *u*, (see fig. 9,) which is a horizontal section of this part of the machine. These moveable side pieces *u*, *u*, are connected to a sliding bar *v*, *v*, (see fig. 7,) which is moved backwards and forwards by means of a screw, in the same manner as the metal plate in fig. 5. *x*, *x*, are fixed side pieces, against which the notched wheel *s*, revolves.

By referring to fig. 9, it will be seen, that as the moveable side pieces *u*, *u*, are advanced, by turning the screw at the end of the sliding bar *v*, *v*, the apertures *i*, *i*, through which the seed passes from the hopper, will be contracted, and therefore lessen the quantity of grain deposited. The notched wheels *s*, are mounted on a common spindle *w*, having, at its end, a small pinion *y*, which takes into gear with a driving wheel *z*, on the axle of the running wheels.

The patentee claims, firstly, a machine for pressing and preparing land for receiving corn, grain, seeds, or manure, in which a number of pressing rollers are employed, each roller being mounted on separate axles, so that it may yield to any inequality in the surface of the ground; and secondly, the use of a long bar or plate, as shewn in fig. 5, for the purpose of simultaneously regulating the escape of grain, in drilling machines, from all the apertures; and the

method, above described, of propelling and guiding the machines; and lastly, he claims the improved constructions of drilling machines, shewn in figs. 7, 8, and 9, and the manner of regulating the supply of grain, through all the apertures, simultaneously, as above described.—[*Inrolled at the Petty Bag Office, April,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM MACKINLEY, *of Manchester, in the county of Lancaster, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics.*—[Sealed 10th November, 1840.]

THESE improvements consist in a novel arrangement of mechanism, designed for the purpose of measuring, folding, plaiting, or lapping goods, whilst they are being made up or packed in pieces, and thus put into a marketable condition.

In Plate XVI., fig. 1, is a longitudinal section of the improved machine, taken through about the middle; fig. 2, is a plan or horizontal view of the machine, as seen from above; fig. 3, is an end view of the same; and fig. 4, another sectional view, taken transversely through the machine. *a, a,* are the side standards or framings of the machine; *b, b,* the end or cross framings of the same; *c, c,* is a carriage or framing, supported upon flanched rollers or wheels *d, d,* which run upon the railways, formed by the planed upper edges of the side frames *a, a.* It will be seen, that this carriage is furnished with two bevilled boards or leaves *e,* and *f,* their tapered edges being opposed to each other, and hinged or jointed by the links *g, g,* to the bearing or standards *h, h,* fixed upon the carriage *c*;

these boards are used, alternately, over and under the cloth, for the purpose of folding or laying it, as will be hereafter explained.

There are also two other bevilled boards or leaves *i*, and *j*, which are hinged or jointed to the cross framing *b*, *b*, by means of the links *k*, *k*; these boards are furnished with a strip of fish skin or other rough surface, and are employed for the purpose of holding or retaining the plaited or folded cloth.

To the side frames *a*, *a*, are screwed slight standards *l*, *l*, supporting the guide rails *m*, *m*, which conduct the cloth, to be folded, into the machine.

It will be seen in fig. 1, that the cloth to be measured, folded, plaited, or lapped, is represented by the dotted line ć, and is proceeding into the machine, in the direction of the arrows.

The operation of the machine is effected by passing the strap *n*, *n*, around the driving pulley *o*, which is keyed upon the shaft *p*, *p*, supported in the pedestals or bearings *q*, *q*. At the reverse end of this driving shaft is a crank-plate or wheel *r*, *r*, with its crank-pin *s*, which imparts, by means of the connecting rod *t*, a reciprocating motion to the radial arm *u*, which vibrates upon its fulcrum *v*, supported by the lower frame *w*. The upper extremity of the vibrating arm is connected by the links *x*, *x*, to the carriage *c*, c; and thus, as it vibrates, traverses this carriage to and fro upon its railways.

The first fold or layer of the cloth c, being laid evenly upon the bed or table *y*, *y*, by means of the board *f*, upon the first traverse of the carriage *c*, it is held by the boards *i*, and *j*, falling upon it; and as the carriage *c*, returns, the board *e*, now falls upon and passes over the cloth, and lays down another fold upon the table *y*; and as the carriage *c*,

runs up towards the end of its traverse, a catch-piece *x*, fixed upon the under side of the carriage, strikes upon the tappet 1, and its tail-piece acts upon the lever 2, under the board *j*, and thus lifts the boards lightly upwards, in order to allow the cloth to be passed under it; when, upon the tappet 1, being released, the board *j*, falls, and immediately retains the folded cloth, whilst the carriage *c*, returns, and the board *f*, falling and passing over the cloth again in its turn, lays down another fold or plait, whilst a similar catch-piece 3, upon the reverse end of the carriage, strikes the tappet 4, whose tail-piece acts similarly upon the lever 5, under the board *i*, and lifts it from the cloth, until the folding board *f*, has completed its operation, and laid down another fold of cloth, which is also immediately retained by the descent of the retaining board *i*, and so on, each folding and retaining board acting alternately as the operation of the machine proceeds.

Now, as the cloth begins to accumulate upon the bed or table *y*, the table is caused to descend, simultaneously, with the folding operation; that is, to lower itself a space equal to the thickness of the cloth, after every fold or layer has been put upon the table. This is accomplished by means of a tappet-roller 6, placed under the carriage-framing *c*, *c*; which, upon every traverse of the carriage, striking against the lever 7, connected to the ratchet or fall 8, thus pulls the ratchet-wheel 9, round the space of one tooth, at every complete alternate traverse of the carriage *c*, *c*. This ratchet-wheel 9, is keyed fast upon one end of the longitudinal shaft 10; and on this shaft there is also a small roller or boss 11, (seen most clearly at fig. 4,) to which the ends of the two cords 12, 12, are attached. These cords pass under suitable guide-pullies 13, 13, and their other ends are attached to the under side of the bed or table

y, y; so that, as these cords are wound upon the roller 11, by the rotation of the shaft 10, the table will, consequently, descend gradually as the cloth accumulates upon its surface; or this descent of the table *y*, may be accomplished by racks and pinions, or any suitable contrivance, its upward tendency and necessary tension being equally maintained by the cords and weights 14, 14, the whole being set in or out of action by traversing the strap-rod 15, 15.—[*Inrolled in the Petty Bag Office, May*, 1841.]

Specification drawn by Messrs. Newton and Berry.

To MILES BERRY, *of the Office for Patents*, 66, *Chancery-lane, in the county of Middlesex, patent agent, for an invention or discovery, by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials, commonly used for such purposes,—being a communication.*—[Sealed 19th November, 1839.]

THIS invention or discovery, is the application and use of a certain description of textile or fibrous plant, generally called or known by the name of "esparto," and is of the class of plants named "stipa," genus "gramina," and is commonly called "esparto," or "stipa terracissima," and grows more particularly on the southern coast of Spain and the borders of the Mediterranean Sea, and Straits of Gibraltar; but is also found at Greece and the northern parts of Africa. This plant is of a fibrous or textile nature, and is capable of being applied to many useful purposes. It grows in abundance in many of the parts above named, and may be easily collected for exportation.

The manner of treating this fibrous plant or material, in

order to render it applicable to the above-named useful purposes, is as follows :—

First,—To make white paper and card-boards, it is necessary to beat or bruise the material or crush it, then to steep it in lime-water, of about the strength of 2 lbs. of lime for 100 lbs. of esparto, allowing it to steep until it begins to ferment. It is then to be put into the ordinary pulp-engines, used in paper mills, and mixed with one-quarter, one-third, or one-half of rags or other fibrous material, according to the strength and quality of paper wanted to be produced. The material being thus reduced, it may be bleached in the usual manner; afterwards, sifted or refined, and made into paper, either by machinery or by hand.

When applied or used to make ordinary papers or card-boards, for the Jacquard loom and other purposes, it can be used in its natural state, after having been left in hot water for about twelve hours, and then acted upon by the pulp-engine, together with one-fourth, one-third, or one-half of rags; these materials being sufficiently reduced to make paper and card-board, as usual.

In order to make ropes or cordage, this material can be used in the natural state, after being saturated with hot water, or after being beaten and combed, or treated like hemp, flax, or other fibrous materials.

And in order to make mats, carpets, cart-covers, or other coarse articles, it can be used in the natural state; or after being beaten and combed, and then dyed in different colours, and woven as usual, with or without other fibrous materials.

The process required to prepare this plant, so as to imitate wool, hemp, &c., and to employ it in place of the same, is as follows:—First, to beat the plant or separate the fibres; then to comb or card it, in either a moist or

dry state; afterwards the required degree of whiteness may be given to it, by means of chloride of lime, or other bleaching material.—[*Inrolled in the Rolls Chapel Office, May,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM CRAIG, *of Glasgow, in the Kingdom of Scotland, engineer, and* WILLIAM DOUGLAS SHARP, *of Stanley, Perthshire, in the same Kingdom, engineer, for their invention of certain improvements in machinery for preparing, spinning, and doubling cotton, flax, wool, and other fibrous substances.*—[Sealed 3rd March, 1840.]

THIS invention consists in the construction and arrangement of certain machinery, for the purpose of rendering the spinning machine called "the mule," as well as the preparation machine, known by the name of "the stretcher," what is usually called, self-acting, or more independent of the operative spinner, who has to perform certain operations in such machines, consisting principally in the backing off; the putting down the faller wire and regulating its motion, so as to distribute the yarn on the spindles in the form of a cop; the putting up of the carriage to the roller beam; and the winding on of the yarn on the spindle, at a proper tension, during the putting up of the carriage.

In Plate XVI., fig. 1, is an elevation of that part of the mule termed the head-stock, with a section of the carriage; fig. 2, represents an end view of the same.

Motion is conveyed from the driving-pulley shaft A, to the rollers, in the same manner as in the hand-mule, and to the twist shaft by means of a diagonal shaft B, which is the same as that adopted in some hand-mules.

Motion is given to the diagonal shaft C, from the ordinary loose pulley of the hand-mule, by means of a pair of mitre wheels, seen in fig. 2; this shaft drives on the shaft D, a bevil wheel, connected on one side with the catch E, and on the other with the catch-plate F; this wheel, with the catches, turns loosely on the shaft D. G, is a lever, similar to that common to hand-mules, for putting in and out the power-catch, and by which the catches E, and F, are shifted on the shaft D, the lower end of the shaft C, partaking of the same motion; H, is the backing-off pinion and catch-plate, which turns also loosely on the shaft D. To this plate are fixed several studs, one of which is taken hold of by a pin, in the catch-plate F. The pinion H, drives a spur-wheel, fixed on the shaft I; on which shaft, there is also fixed the pinion J;—K, is a similar pinion, which turns loosely on the twist-shaft, and to which it is connected by a ratchet-wheel and click, so as to give motion in only one direction; L, L, is a toothed rack, attached to the framing by studs. To these studs are fitted anti-friction rollers, on which the rack moves up and down, and by which it is retained in a vertical position. M, is a lever, connected by a jointed rod to the break N^2, which forms the segment of a circle, covered with leather, to embrace the break-pulley N; O, is an inclined plane, fixed to the rack L; G^2, is a lever, connected at the top of the lever G, (as shewn by the dotted lines,) in such a manner, that when the lever G, is drawn from the retaining catch, the lower portion of the lever G^2, will make a corresponding motion towards the roller-beam.

On the shaft D, there is keyed fast the catch P, into which the catch E, takes. On this shaft there is also fixed the pinion Q, which drives a wheel R. On the same shaft with this wheel is fixed the double excentric pulley *s*, *s*; from the upper and under side of which, bands or chains, after being made fast, proceed, and are fixed to the pulley A^2,

shewn in dotted lines. The bands or chains are so fixed, that the stretch of the carriage may be commenced and terminated, when the band or chain is winding off or on at that point where it approximates nearest to the centre. On the same shaft with the pulley A^2, is fixed the pulley B^2; a band, after being made fast to it, passes over the carrier-pulley 14, and from thence to the carriage; a similar band passes from the other side of the pulley, and after going round the carrier-pulley 15, is also made fast to the carriage.

2, 2, 2, represents the framing of the end of the carriage. A cast-piece *3, 3,* is made fast to it by means of screw-bolts at the top and bottom, as shewn in fig. 1; to this casting are fixed two studs, on which slide the perpendicular bar 4, having attached, at its lower end, an anti-friction roller, which moves over the shaping-rail or building-plate T, T. Attached by a joint to the perpendicular bar 4, is a rod 5, which, at its upper extremity, terminates in an inclined plane, of the form shewn in fig. 1. The inclined plane presses against an anti-friction roller, fixed to a perpendicular rod; which, on its other side, carries an anti-friction roller, moving in a slot in the faller-crank 6. The perpendicularity of this small rod is maintained by means of two guides, with slots formed in them; one only of which is seen at 7, the other being removed, for the purpose of shewing the other parts.

U, is the winding-on spiral pulley, which will be better understood from fig. 3; V, is also a spiral pulley, fixed to the head-stock, from which the band is gradually given out to the pulley U, during the process of forming the bottom of the cop; this is effected by means of a rack 8, an adjustable projection, from which, being laid hold of by a forked prong in the carriage, in its coming out from the roller-beam, the rack is carried along with it, and in its progress

turns a small pinion, connected to a shaft, (by a ratchet-wheel and click,) having at the top a worm, working into a worm-wheel, fixed on the spiral pulley; in the in-going of the carriage, the rack is carried to its former position; but, from the click, on the pinion, over-running the ratchet, no motion is imparted to the spiral pulley, it being so proportioned as to give out the requisite quantity of band to the pulley U; so that through it the number of revolutions imparted to the spindles, in winding on the yarn, may be reduced in the proper amount during the process of forming the bottom of the cop.

The scroll U, is connected with the upright shaft W, on the end of the carriage, by means of a bevil pinion, which drives a bevil wheel, turning loosely on the shaft W, and is connected with it, in the process of winding on, by means of a ratchet and clicks. These clicks are so connected with the plate 10, and the two prongs affixed to it, that when the plate is lifted up and retained, it prevents the clicks from acting on the ratchet-wheel; this is effected by means of small curved plates, attached to the prongs, which, on their being raised, press on pins, projecting from the clicks. The plate is lifted up by the rod 11, which, at the bottom, terminates in a joint, moveable in one direction only, and is so constructed as to raise the rod immediately on the commencement of the out-coming of the carriage, by its pressing against the bracket 12; while in the in-going of the carriage it is not effected by the yielding of the moveable joint; 13, is a lever, which retains the plate, when raised, until the carriage is about to go in to the roller-beam, when it is released by the action of the lever G^2, withdrawing the lever 13. This lever, from being connected to a spiral spring, has a tendency to go into the catch on the plate 10; D^2, is a double-band pulley of different diameters;—from the largest diameter a band, after being fixed and making a

coil or two round, passes under a carrier-pulley, on the framing, and from thence to a projecting pulley, fixed on the same arbor with the scroll-pulley U, where it is also fixed. From the smaller diameter of pulley D^2, a band, after making a coil or two round, is fixed to a weight 37; the use of which is to cause the scroll-pulley to wind up the band in the going out of the carriage. 16, is a small catch, for retaining the lever 17, when it has been raised by the winding of a chain, or the moving of a rack, in connection with the shaft, on which is fixed the pulley B^2; the end of which rack or chain, is connected with the upright part of the lever 17. On the lower part of this lever is fixed an anti-friction roller, that, in the falling of the lever, presses against an arm 19, from the lever-shaft, common to hand-mules, and by its action (caused by the spiral spring 23, attached to a projecting arm from the centre of the lever), the various catches are changed, and the motion of the machine reversed.

The rods from the lever 20, are connected in the same way with the catches as they are in the hand-mule, with this exception;—two of them, those for shifting the strap-lever, and for putting out of action the in-taking motion of the carriage, are connected with a short lever 21, (attached by a stud to the framing,) which is actuated by the rod 22. The two rods are connected with the same stud in the crank, on which they move in slots, for the purpose of allowing the out-coming of the carriage and the action of the rollers to cease, while the twisting motions of the spindles may still continue.

A bevil wheel 24, is fixed on the shaft, commonly known in the hand-mule as the "Mendoza" shaft; this wheel drives a wheel 25, on the small shaft X, on which is fixed the wheel 26, which drives a wheel 27, on the same shaft with the pulley B^2; by these wheels the carriage is taken out from the roller-beam T, T.

The building-plate or rail, for forming the cop, is at its highest elevation at the commencement of the formation of the cop; as this proceeds, it is gradually lowered, by a projecting stud, from the carriage pressing on the lever 34, which is, at its other extremity, connected with a lever, carrying a click, by which the ratchet-wheel 35, is turned a portion of a revolution, each draw or stretch of the carriage. This wheel is fixed to a small rod or shaft; its other end being formed to a screw, works through a nut that is fixed to a small rod, to which are attached the two plates 36, 36, formed, in their upper edge, into inclined planes; on these rest studs, fixed to the building-plate, and the motion which is given the inclined planes, permits the gradual falling of the building-rail or plate T, T. The drum-band passes, in entering the carriage, once round one of the grooves on the pulley, fixed on the shaft W, and then round a small stud-pulley, fixed to a small bracket, attached to the end of the carriage.

The wheels, on the shaft A, which give motion to the diagonal shaft B, and the diagonal shaft which proceeds from the opposite sides, to drive the rollers, are in one casting, and turn loosely on the shaft A, to which they are connected by a clutch or catch, that admits of a sliding movement along a key, fixed to the shaft. The handle Y, is for the purpose of actuating this clutch, and by which the machine is stopped,—the pulley shot A, continuing to revolve, but without communicating motion to the wheels.

Fig. 3, is a plan view of the scroll or spiral pullies, shewing their relative position. *y*, *y*, shews the casting, attached to the end of the carriage, and by which the end of the scroll U, is carried; *x*, a friction-roller, over which the band 9, passes to the scroll.

Fig. 4, represents another method by which the winding-on of the yarn is effected. *a*, is a pinion, fixed on the shaft,

which, in the other arrangement, carried the scroll or spiral pulley U; *b, b,* a toothed rack, supported on anti-friction flanched rollers, that it may move freely in a longitudinal direction; *c,* is a wheel, fixed to a shaft, attached to the roller-beam end of the head-stock; *f,* represents a horizontal lever, the centre of which is fixed to the head-stock, at the opposite end to that of the rack *e,* to which it is attached by a stud, fixed to the rack, and working in a slot at the end of the horizontal lever. *g,* is a projecting piece, from the end of the carriage, and partaking of its movement to and from the beam, carrying an anti-friction roller, on which the horizontal lever rests; this projecting piece is connected to the carriage by means of a slide, to which is fitted a screw, carrying, at its upper extremity, a ratchet-wheel; through which, at each stretch of the carriage, the projecting piece *g,* is elevated a certain portion, during the process of forming the bottom of the cop.

It will be seen, that from the position of the horizontal lever, in connection with the projecting piece on which it rests, no motion will be permitted to the pinion *d,* or wheel *c,* during the going in of the carriage; and that, consequently, the pinion *a,* will make the full amount of revolutions proportionate to its diameter, and the length of the stretch. This speed, attained by the pinion *a,* is, by the wheels, in connection with the shaft W, (see fig. 1,) adapted to the requisite amount for winding the yarns on the bare spindle.

As the cop-bottom goes on increasing, the projecting piece *g,* by the action of the screw and ratchet wheel, is also, at each stretch, gradually rising, until, when near the completion of the cop-bottom, it will have attained the height, shewn in dotted lines, (see fig. 4,) which shews its position in relation to the lever *f.* When the carriage is near the extremity of the stretch, the horizontal lever will

now also be made to assume the position shewn in dotted lines; the rack *e*, will also have been elevated, corresponding with that seen in dotted lines. The rack *b*, *b*, will have been carried a certain length along the carriage in its going out from the beam, and the lever attained the position shewn.

It will now be evident, that on the carriage commencing its progress towards the roller-beam, the end of the lever will fall in a continually decreasing ratio, until the carriage approaches the rollers. This action of the lever permits the rack *b*, *b*, to be carried in along with the carriage, in the same decreasing ratio in which it falls, thereby diminishing the amount of revolutions imparted to the spindles by the pinion *a*, in the proper amount for effecting the winding on of the yarn.

The following is a description of the operation of the machine:—Suppose the carriage to be up to the roller-beam when the process of twisting and the drawing or giving out of the roving by the rollers commence; these motions are performed in the same way as in the hand-mule; the only difference being in communicating the motion for bringing out the carriage, which is done by the bevil-wheels, in connection with the shaft X, giving motion to the pulley B^2, and thereby gradually bringing out the carriage from the rollers. The carriage having arrived at or near its greatest distance from the rollers, a pin from it presses on the spring-lever 28, which elevates the rack L, L, so much as to bring the teeth in contact with the pinion J; so that when the pinion commences to revolve, it will also cause the gradual elevation of the rack. The stopping of the movements of the carriage and rollers being the same as in the hand-mule, and well known to those conversant with such machines, needs no description here.

The stopping of the revolution of the spindles, after the

desired quantity of twist has been given to the yarn, is also effected in a similar manner to that in hand-mules. It is only after the completion of these motions, that the self-acting movements, applied to the machine, may be said to commence.

Motion being given to the driving pulley, the shaft C, will revolve, and through it, by the intervention of the catch-plates F, and H, which are now in contact, the shaft I, with the pinion J, will also be in motion, and imparting a slow movement upwards to the rack L, L. The first effect which this motion of the rack produces, is to stop the action of the spindles; this it does by a projecting part 29, from the rack pressing against the lever M, connected by a jointed rod with the break N^2, which it presses firmly against the break-pulley N, after the rack has passed over the lever M. The inclined plane O, fixed to the rack, comes in contact with an anti-friction roller, fixed on the inclined plane 5, attached to the carriage; the action of the one causing the rod 5, gradually to assume a perpendicular position, while the other, it may be seen, is effecting the depression of the faller. When the faller-wire has arrived at or near the points of the spindles, the lower portion of the toothed rack has come in contact with the pinion K, on the twist-shaft, which it causes to revolve, thereby giving a backward motion to the spindles, for the purpose of removing the coils of yarn that range along their surface. The process of "backing off" and putting down of the faller, continue going on, simultaneously, until the rod 5, assumes a perpendicular position; and the anti-friction roller, on the same perpendicular rod, having passed over the inclined plane, rests on the flat part immediately behind the inclined portion. When this has taken place, the point of the inclined plane will have pressed on the small lever 30; which, on one end, is furnished with a per-

pendicular part, of such length that it may be acted on by the inclined plane, at any height of the building-rail T, T, which actuates the small lever 31, and by its action on the curved portion of the retaining catch, causes the raising of the same, which allows the action of the spiral spring, (shewn in dotted lines,) to shift the lever G; the motion of this lever thereby causing the backing-off plate F, to slide from H, and the in-taking catch E, to enter P; this action of the lever G, gives also a forward motion to the bottom portion of the lever G^2, which throws out the catch 1, that holds the carriage out to the extent of the stretch, and also the catch 13, in the carriage, which retained the plate that held the winding-on clicks out of contact with the ratchet-wheel, and thereby permits the winding-on motion to actuate the shaft W.

The carriage now commences its inward progress towards the rollers, which it performs by means of the double excentric pulley, with a gradually increasing speed, to the middle of the stretch, and then a gradually diminishing speed, until it reaches the roller-beam. When the carriage has arrived at or near the end of the stretch, the rod Z, comes in contact with a set-screw in the framing, by which means the inclined plane is pressed out, and the guides are allowed to rise; while, at the same time, a prong from the carriage releases the lever 17, from its retaining catch, by pressing on the bottom portion of the lever 16: the lever 17, being thus freed, and the action of the spiral spring 23, permitted to act on the arm 19, through the anti-friction roller fixed on the lever 17; by which action the motions of the machine are changed or reversed.

The lever 17, is brought in contact with the retaining catch, in the coming out of the carriage, by the winding of a chain round the shaft, on which is fixed the pulley B^2; the end of the chain being connected with the upper part

of the lever 17. During the going in of the carriage, the toothed rack L, which had been raised in effecting the process of "backing off" and putting down the faller, gradually falls to its former position, clear of the pinion J, from its weight overcoming the resistance of the wheels, with which it is then connected. The pinion K, from its connection with the twist shaft, by a ratchet-wheel and click, moves in the proper direction for the falling of the rack, by overcoming the ratchet-wheel.

In the going in of the carriage, the yarn is put on the spindles, at the proper part, by the rod 4, which has, at the lower extremity, an antifriction roller, pressing on the building-plate or rail, and the inclination which this rail has downwards, gives to the faller wire, through the rod 4, a corresponding motion upwards; which, from the falling of the rail T, is, at each stretch of the carriage taking place, at a higher portion of the spindle. The winding-on of the yarn is effected by the motion given the scroll or spiral pulley U, by uncoiling the band 9, from the varied diameters of which it is composed at the commencement of the cop. In winding the yarn on the bare spindle, the band is unwound from nearly a parallel portion of the pulley from the points 2 to 1, as seen at fig. 3.

As the cop-bottom increases in diameter, the band will commence to unwind at a greater diameter of the pulley U, and thereby diminish the number of revolutions imparted to the pulley, in the going in of the carriage. This is effected by the giving out of the band from the pulley U; from which, as formerly described, a gradually diminishing length of band is, on the out-coming of the carriage, at each stretch, let off, until the unwinding of the band will be (at the completion of the cop-bottom) commencing at the point 3, and terminating at the point 2. The requisite winding-on will continue the same, and the band to

unwind from the point 3, to the point 2, until the finishing of the cop.

The patentees claim, Firstly,—The arrangement of the shaft C, with the wheels and catches on the shaft D, occupying the same position as that in the hand-mule, known as the power-shaft, by which is effected the conveying and disengaging of the motions for backing off and putting up the carriage.

Secondly,—The application of a toothed rack L, by which is performed, or brought into action, the motions for putting down the "faller" or "backing off" the coils of yarn from the surface of the spindles.

Thirdly,—That arrangement of the two inclined planes, in connection with the rack L, by which the faller is put down and retained in the proper position for commencing and guiding the distribution of yarn on the spindles.

Fourthly,—The construction and application of a double executive pulley, for the putting up of the carriage to the rollers.

Fifthly,—The method shewn in fig. 1, by which the motions of the mule are changed, on the carriage reaching the roller-beam.

Sixthly,—The two modes shewn at figs. 3 and 4, of winding-on the yarn on the spindles, with the mode of connecting and disconnecting the said motion from the shaft W.—[*Inrolled at the Petty Bag Office, September*, 1840.]

To ROBERT ORAM, *of Salford, in the county of Lancaster, engineer, for certain improvements in hydraulic presses.*—[Sealed 12th June, 1841.]

THESE improvements, in hydraulic presses, consist in a simple additional apparatus to the common hydraulic press,

for the purpose of causing the ram, with the table, to ascend or be brought into action with greater speed, in such cases where the articles, under pressure, are of a light description, such as wool, horse-hair, roots, &c., until the extreme pressure is required.

This is effected by the introduction of a small stationary ram into the bottom of the cylinder, and extending partially into the common ram, which is bored to receive it, and thus converted into another cylinder. The effect of this will be, that the water pumped into the interior of the ram, which, for the sake of illustration, may be supposed to be bored out to four inches in diameter, instead of being forced against its lower extremity, and thus into the interior of the cylinder, say ten inches in diameter at every stroke of the pump, will consequently raise the ram considerably quicker, or in proportion of about sixteen to one hundred; that is, sixteen strokes of the pump, with the application of this improvement, will be equal to one hundred strokes in the ordinary press.

In Plate XVII., is a drawing, shewing the cylinder and ram in section. *a, a,* is the common cylinder of the press; *b, b,* the ram; *c,* the table. It will be seen that the ram is bored hollow, for a space at *d,* the extent of the space extending upwards, according to the quality of the goods to be packed.

A small stationary ram *d, d,* is fixed into the cylinder, and extends upwards into the body of the common ram *b, b*; the mouth or open end of which is packed with either a single or double cup leather, as at *e, e,* the same as at the upper part of the cylinder.

Now, it is evident that, as the water is pumped into the ram through the pipe *f, f,* a vacuum would be formed in the cylinder, under the ram *b, b*; to obviate which, water is allowed to flow in through the pipe *g,* which is provided with a stop-cock, to be used as occasion may require.

The patentee claims the boring out of the ram, to convert it into an interior cylinder, and the introduction of the smaller stationary ram into the same, in order that the strokes of the pump, in working, may tell quicker upon the goods under pressure.—[*Inrolled at the Petty Bag Office, December*, 1841.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS CLARK, *of Wolverhampton, in the county of Stafford, iron-founder, for an invention of certain improvements in the construction of locks, latches, and such like fastenings, applicable for securing doors, gates, windows, shutters, and such like purposes,—being a communication.*—[Sealed 22nd October, 1840.]

THIS invention consists in the substitution of weights or weighted levers, instead of the springs usually employed in locks, latches, and such like fastenings, for the purpose of keeping the bolts in their proper positions, after having been shot by means of a key or other instrument, in the usual manner.

In Plate XVII., fig. 1, represents the interior of a lock; the plate or cover being removed, all its parts are shewn as in a quiescent state; the lock-bolt being removed, and its situation shewn by dots.

Fig. 2, represents the lock, with the bolt thrown or forced back, the key having performed a reverse revolution. The catch-bolt, in this figure, is shewn as drawn back into the lock, and the door at liberty to be opened. *a, a,* is the box or casing of the lock, containing the moving parts; *b, b,* is the lock-bolt; *c, c,* is a tumbler, turning loosely on a centre at *d*. A weighted lever *e, e,* is also mounted on the same centre, and has two studs or projections *f*, and

g, formed on it, for the purpose of catching or taking into an opening or recess, made in the lock-bolt, and retaining the same in any position in which it may be placed; *h*, *h*, is the ordinary catch or latch-bolt, and is moved by a handle, in the usual manner. To the inner end of this bolt, a weight, or rather (as it may be termed) a weighted lever *i*, is connected by a joint. This lever is mounted on a centre or fulcrum, at *j*. The spindle of the handle of the lock is shewn at *k*, and has two small levers *l*, *l*, attached to it at right angles, or nearly so, to each other; which are for the purpose of raising the weighted lever *i*, and withdrawing the catch-bolt into the lock, when the door is required to be opened.

The different parts of the lock being in the position shewn in fig. 1, and the lock-bolt, as seen by dots, the key is to be introduced into the lock, and turned round, in the direction of the arrow, for the purpose of raising the brass tumbler *c*, *c*, and weighted lever *e*, *e*, so as to release the studs *f*, and *g*, from the recesses or openings formed in the lock-bolt. This having been effected, and the motion of the key continued, its end being in contact with the lock-bolt, the latter will be shot forward; and from the peculiar form of the under part of the tumbler, and weighted lever *e*, *e*, these two parts are kept elevated, while the bolt is being shot forward by the key; when the studs *f*, and *g*, are again allowed to descend into their proper places, in the other notches or recesses, and prevent the bolt from being moved or returned, without the agency of the key.

Whenever the lock-bolt is withdrawn, upon the door being required to be opened, then the catch-bolt is withdrawn also, by turning the handle either way; which, by means of the small levers *l*, *l*, attached to its spindle, raises the weight *i*, and draws in the catch-bolt *h*, *h*, into the position shewn in fig. 2.

In the drawings only one tumbler is shewn, as applied to this improved construction of lock or fastening; but it is evident, that two or more may be employed, if it is required, to make the lock more secure; but a common door-lock may, for economy, be made without any tumbler whatever, the weighted lever *e*, *e*, upon which the studs *f*, and *g*, are formed, being a sufficient protection against opening the lock surreptitiously.

These improvements may be also applied as fastenings to windows, commonly called "French casements," or those opening on hinges, like a door, as well as to those opening by moving up and down, as sashes, by placing the lock, latch, or bolt (in this instance) on the side bead or panel of the window, and forming a recess or mortice in the sash, into which the bolt will be shot, by the weighted lever, when the window is shut down; but the bolt will be kept back, or within the case of the lock when the window is open, without any other agent or part, the end of the latch or bolt being in contact with the plain part of the sash.

The patentee claims,—the substitution of weights or weighted levers for springs, in the construction of locks, latches, and other fastenings, in the manner above described. —[*Inrolled at the Petty Bag Office, April*, 1841.]

Specification drawn by Messrs. Newton and Berry.

To Joseph Stubs, *of Warrington, in the county of Lancaster, file manufacturer, for an invention of certain improvements in the construction of screw-wrenches and spanners, for screwing and unscrewing nuts and bolts, —being a communication.* —[Sealed 31st December, 1840.]

This invention consists in an improved construction of screw-wrench or spanner, for turning screw-bolts or screw-

nuts, and in a novel mode of opening or closing, and holding the jaws or chaps of screw-wrenches or spanners, whereby such instruments are made considerably stronger than those upon the old construction.

In Plate XVII., fig. 1, represents a side view of the screw-wrench or spanner, complete; fig. 2, is a vertical section, taken longitudinally through the same; and fig. 3, is a vertical section, taken transversely, or at right angles to the former through the line A, B. *a*, is the fixed chap, forming one piece with the stem and handle *b*, *b*; *c*, *c*, is the moveable chap, which slides along the stem in the slot *d*. Fig. 4, is a side view of the moveable chap, detached; and fig. 5, a front view of the same.

A screw shaft *e*, inserted into the head of the chap *a*, is fixed in a position parallel to the back of the stem *b*, passing through a cylindrical opening in the head of the moveable chap; and at its outer end, this shaft is held by a shaft *f*. The moveable chap *c*, slides freely along the stem in the slot *d*, in order that the jaws of the spanner may be opened to any required distance; and when the moveable chap has been placed in the desired position, the nuts *g*, and *h*, upon the shaft *e*, are screwed up to their bearings against the head of the moveable chap, which thereby confines it securely.

When any alteration in the distance between the chaps is required, it may be effected readily by increasing either of the nuts, and moving the chap *c*, backward or forward by hand, and then screwing the nuts up to the moveable chap, as described, so as to prevent it from moving.

In manufacturing this improved screw-wrench, it is necessary to fit the moveable chap into the slot of the stem, and to make it slide freely therein before the slot is closed, by welding on the handle.

The patentee claims the moveable chap sliding in a slot

in the stem,—the distance between the two chaps *a*, and *c*, being regulated and determined by nuts moving along a stationary threaded shaft.—[*Inrolled at the Petty Bag Office, June,* 1841.]

Specification drawn by Messrs. Newton and Berry.

To John Wordsworth Robson, *of Wellclose-square, in the county of Middlesex, artist, for his invention of a certain improvement or improvements in water-closets.* —[Sealed 2nd November, 1840.]

These improvements in water-closets are as follows:— In Plate XVII., fig. 1, is a perspective view of the improved construction of water-closets for ships, the several parts of which will be better seen by reference to the detached views. A, is a bed-block, having two mortices cut in the top of it. B, is a bed-plate, of iron or brass, having two tubes or pipes cast upon its under side, which tubes rest in the mortices in the bed-block, as indicated by the dotted lines at *a*, and *b*. This plate is let into the bed-block level with its surface, and firmly bolted thereto. In the plate are four holes, numbered 1, 2, 3, and 4. No. 1, is a circular hole, through which the soil and water passes from the basin into the tube *a*, leading to the cylinder *c*. This cylinder may be made of cast-iron, brass, or copper. It is fastened to the bed-block by bolts *c*, passing through the lower rim of the cylinder, the bed-plate and bed-block, by which it is held firm in its position. D, is an ordinary hopper basin, fastened to the bed-block, over the hole 1, by screw-bolts *d*. The soil and water are drawn from the basin to the cylinder by vacuum, produced by raising the inverted conical-shaped leather E, which forms the cover of the cylinder. This leather, when moulded of the form

shewn in the drawing, and placed within the cylinder, the smaller end downward, performs the office of a piston. F, is a metal rim, the same size and thickness as the upper flange of the cylinder, which is placed upon the top of the leather, and firmly bolted to the upper flange of the cylinder by screw-bolts; G, G, are two small metal plates, having a square hole in the centre, through which the bottom of the piston-rod passes. These metal plates are of the same size as the smaller end of the leathern cylinder top; one of which is placed within the bottom of the leather, and the other upon the under side thereof; H, is the piston-rod, having a square shoulder at the bottom, which passes through the square hole in one of the metal plates G, through the centre of the small end of the leathern top, and the square hole in the plate G, beneath it, with a screw and nut at the end, to hold it firmly in its place.

When vacuum is to be produced in the cylinder, the piston-rod is raised, and the small end of the leathern top is drawn out of the cylinder, the same height above it as in the reverse or downward stroke. It occupies, within it, the two plates G, G, at the bottom of the piston-rod, and the metal rim F, upon the top of the cylinder, effectually preventing any escape of air from within the cylinder at the top.

The hole in the bed-plate is covered with a stong leathern valve I, having a rim, which is placed under the lower rim of the cylinder, and prevents the escape of air or water between the cylinder and bed-plate, to which it is firmly bolted. This valve is mounted with metal, to assist in closing it, after having been opened by vacuum.

When the soil and water in the basin have been drawn into the cylinder, by raising the piston-rod and withdrawing the leathern cone from within the cylinder, the stroke is reversed, the valve is closed, and the soil and water are

driven through the hole 3, into the tube 6, leading to hole 4, as seen by dotted lines in the drawing. The hole 4, is of the same size as 1, and 2, and covered with a strong leathern valve, exactly similar to that over hole 2. This valve is within the soil-pipe head K, which supplies the place of a valve-box, and is of different dimensions, to permit the free working of the valve within it. It is opened by depressing the piston-rod within the cylinder, and forcing the soil and water therein into the soil-pipe head, through the soil-pipe *e*, into the water or other receptacle. It is closed by atmospheric pressure, or by raising the piston-rod, and the leathern cone within the cylinder. The soil-box or pipe-head is fastened to the bed-plate and the bed-block by screw-bolts *f*, as shewn in the drawing.

When the closet is placed below the level of the water, on board a ship, a hanging valve may be placed at the end of the soil-pipe, so as to prevent the ingress of water upon the valve in the soil-pipe head, if thought advisable; but this is by no means essential to the safe and efficient working of the valve within the soil-pipe head, over the hole 4.

L, is a strong triangular-shaped brass or iron upright, fastened to the top of the cylinder bolt. To the elbow *h*, of this upright, is attached one end of the lever *i*, by which all the machinery is worked. The top of this upright is supported by a wrought-iron or brass stay *k*, fastened at the bottom to the upper rim of the cylinder, and at the top by a bolt passing through the side of the valve-tap, upright, and stay. M, is the valve-tap, bolted to the upright, and is the medium through which the water passes from the cistern to the basin. In the centre and lower part of this valve-tap, there is a small stuffing-box *l*, the bottom of which is formed by the flat surface of the top of the upright. Through the centre of this stuffing-box, rises a small tube, through which passes the tap-rod N. The

object of this stuffing-box and valve, is to prevent any leakage, when the valve of the tap is raised to admit water into the basin. Around this tube, and over the stuffing-box, there is a chamber *m*, in the tap, covered by a strong leathern valve *n*; which valve, being opened by raising the tap-rod N, admits the water into the said area, from whence it is conveyed to the basin by a small leaden pipe *o*.

In the upper part of the valve-tap O, there is a recess, of sufficient dimensions to permit the valve to work freely within it; from whence proceeds a small pipe *p*, to the cistern or reservoir, which supplies the tap with water. The valve is raised by the tap-rod, which passes through the lever, the upright, the stuffing-box, and tube, in the lower part of the tap, directly under the centre of the valve *n*. In the middle of the tap-rod are two projections or shoulders *q*, which rest upon the opening in the lever, through which the tap-rod passes, and by which the tap-rod is raised. The bottom of the tap-rod has two arms or branches *r*, which work up and down, in holes made in the upper flange of the cylinder. The tap-rod and piston-rod are both raised and depressed by the same lever; one end of which is bolted to the elbow of the upright; the other end having an ordinary lift-piece *s*, coming through the top of the seat above the closet, with which the lever and the entire machinery are worked.

Fig. 2, represents an improved construction of portable water-closets. *a*, is a leaden or zinc cistern, which may be constructed of any convenient size, and placed above the level of the closet, in the back part of a chair, or in any other suitable frame; *b*, is a pipe, in the top of the cistern, through which it is filled with water; *c*, is the valve-tap; *d*, is a small leaden pipe, through which the water enters the basin from the cistern; *e*, is the tap-rod, by which the

valve *c*, is raised, and water admitted into the tap, and from thence to the basin, the bottom part of the tap-rod being attached to the lever *f*, as shewn in the drawing, by which it is worked. One end of this lever *f*, is attached to the frame-work of the cistern, and the other end to the lift-piece *g*, by which it is raised or depressed at pleasure. To the bottom of this lift-piece there is a counter-balance weight, which rests against the end of the lever *l*, and keeps the valve *k*, of the basin *i*, closed. When the lift-piece *g*, is raised, the valve *k*, opens, and the soil and water therein pass into the case or receiver; *h*, is the hole in the basin, into which the pipe enters, conveying the water from the valve-tap to the basin; *m*, is an ordinary zinc case or receiver, which may be made of any form or size, and adapted to the bottom of a chair or other suitable frame.

Fig. 3, represents a side view of a house-closet, complete in all its parts. *a*, is a bed-block and frame; *b*, is a bed-plate, with tubes, cast upon the under side thereof, and let into the bed-block, in the same manner as the bed-plate and tubes of the ship's closet; *c* is a plain cast-iron or brass cylinder, having an inverted conical-shaped leathern top, metallic plates, and piston-rod. Holes, similar to those marked 1, 2, 3, and 4, in the bed-plate of the ship's closet, are formed.

The water is drawn into the cylinder through the pipe *d*, by raising the piston-rod and leathern cone, within the cylinder. Over the hole 2, at which the water enters the cylinder, there is a strong leathern valve, which opens when the piston-rod is raised; and when the stoke is reversed, it closes, and the water is forced out of the half circular hole, 3, through the tube, under the bed-plate, into the valve-box *e*, and through the water-pipe *f*, into the basin *g*.

Over the hole 4, in the bed-plate, within the valve-box *e*, is a strong leathern valve, exactly similar to that within the soil-pipe head, in the ship's closet.

The use to which the cylinder of the house-closet is applied, is simply to supply the basin with water, while in the ship's closet the same cylinder is used to expel the soil and water from the basin. *h*, is a valve-plate, covered with a strong leathern valve, rivetted upon suitable bearings, and working upon an ordinary axis. This valve, by the downward stroke of the lever, closes the bottom of the valve-plate, and effectually prevents the escape of water from the basin; *i*, is a small tumbler, connecting the lever with the bearing of the valve within the soil-box *k*, by means of which the valve is opened and closed; *l*, is an ordinary closet-lever, one end of which is bolted to an upright *m*, the other being connected with the lift-piece *n*, with which the lever, piston-rod, and the leather cone within the cylinder, and valve within the soil-box, are severally worked; *o*, is the pipe, through which the soil and water pass into the soil-box.

The patentee claims, firstly, in the ship's water-closet, the bed-plate and tubes, attached thereto, through which the soil and water pass from the basin into the cylinder, and thence into the soil-pipe; secondly, the leathern valves, by which vacuum is produced within the cylinder, and in the valve-box or soil-pipe head, and the valve-box, in which the valve is contained; thirdly, the inverted conical-shaped cylinder top, with the metal plates, upon the top and bottom thereof, and the method of working the same, (so as to obviate the necessity of a solid piston, cylinder-top, and stuffing-box,) by creating vacuum in the cylinder, without friction, and by the application of less power than has ever before been used; fourthly, the valve-top, by which water is admitted into the basin with the tap-rod, and the method

in which the same is worked; fifthly, (in the portable closet,) the valve-tap, by which water is admitted into the basin, the leathern valve, at the bottom of the basin, and the method of working the valve; and sixthly, (in the house-closet,) the bed-plate and tubes, attached thereto, through which the water passes from the cistern or reservoir into the basin, and the leathern valves within the cylinder and valve-box, and the leathern valve, at the bottom of the valve-plate, which works within the soil-box; also the inverted conical-shaped leather cylinder top, and metallic plates, attached to the bottom thereof, and the method of working the same.—[*Inrolled in the Rolls Chapel Office, May*, 1841.]

To George Holworthy Palmer, *of Surrey-square, in the county of Surrey, civil engineer, and* Charles Perkins, *of Mark-lane, in the city of London, merchant, for improved constructions of pistons and valves, for retaining and discharging liquids, gases, and steam.*—[Sealed 28th November, 1840.]

These improvements in pistons and valves may be divided into two parts:—

The first part of the invention is an improved construction and application of what is termed " an elliptic self-adjusting balancing piston," which, by certain modifications, may be used as a valve. And further, in the adaptation of one or more of the said pistons, which perform the duties of pistons or valves, or both, as the particular application may require.

The second part of these improvements consist in the construction and application of a double balancing valve, constructed and acting in the manner hereinafter described.

Fig. 1, is a plan view of the piston, and is shewn in vertical section at fig. 3;—A, B, being the major, and C, D, the minor diameter of the same. On the major diameter at R, is an adjustable knuckle or joint, to which the piston-rod P, P, is to be secured, by any suitable means, so as to admit of the piston swinging or adjusting itself freely in the direction of the major diameter, thereby enabling the piston to come into close contact with the cylinder H, H, in which it works up and down; or, when acting as a valve, to open a communication from the one side to the other of the piston, as occasion may require.

The adjustable knuckle is shewn in the figures as passing through a mortice in the piston, and is secured thereto by a flange and screws or other means. The middle of the knuckle joint is in the line of the major diameter A, B, situated at any required distance from the centre of the minor diameter C, D, and consequently of the cylinder or barrel, such distance being regulated as may be practicable, with reference to the difference of areas of the piston on each side of the minor diameter C, D;—the dotted circles in figs. 1, and 2, shewing the inner diameter of the cylinder or barrel.

Fig. 2, is a plan view of the piston, used as a valve; it is also shewn in section at fig. 3;—A, B, being the major, and C, D, the minor diameter, parallel to, and at such a distance from the minor diameter, as circumstances, (similar to those effecting the position of the knuckle or joint in the piston before described,) may require; and upon one side of the valve an axle O, O, is affixed, secured by screws or other means. This mode of securing the axle, admits of the valve being removed, and replaced without disturbing the axle, the ends of which pass through the working cylinder, and are supported on the outside by suitable air-tight bosses or bearings, bolted to the cylinder, after the valve and axle

have been accurately fitted and bedded therein; the precise excentricity or distance of the axle from the centre of the cylinder, being regulated with regard to avoiding, as much as possible, the destructive concussion of valves in pumps, which is greater or less, according to their diameters and lifts, weight of rods, and other circumstances.

To provide against the elliptic piston and valve, abrading the cylinder, in which they act during their change of position, it is requisite that the sharp edge, on the under face of each, should be a little rounded off towards the centre or half thickness of each piston and valve, at the points where the minor axis C, D, terminates.

The minor axis or diameter of the piston and valve, will be the same as that of the cylinder or barrel, while their major axis or diameters may be as much greater as practice may suggest.

One mode or method of obtaining an elliptic piston, that shall fit well and work with little friction, is by constructing a solid cylinder, turned to the same diameter as that of the interior of the cylinder or barrel; then cutting the same obliquely into portions, and of the required thickness, as shewn in section at fig. 3, where the two dotted lines S, S, denote the length of the solid cylinder, as so cut, and A, B, the oblique cut,—by which means an elliptic piston or valve is obtained.

H, H, fig. 3, is a vertical section of a pump-barrel, representing the elliptic piston and valve; the former making the up or effective lift, as denoted by the arrow, when the water presses from beneath on the larger area of the valve A, (see the left-hand side of the axle in the drawing,) and, consequently, unequally opens the valve. On the same principle, when the piston ceases to move upwards, and commences its descent, the column of water, then pressing on the upper side of the larger area A, of the valve, will

cause the valve to resume its seat, or contact, with the minor diameter of the working barrel. Q, is a guide, intended to keep the piston-rod parallel with the working barrel or cylinder.

It will be evident, the only difference between the piston and valve, is that of applying a fixed spindle to the valve, moveable upon its axle bearings, and to the piston or piston rod, connected with a knuckle or joint, as before described, allowing the piston to move in the direction of its major diameter A, B.

If the elliptic piston is intended to be effective, both in its up and down strokes, as it must be when applied to what are technically called "single or double-power engines," then the piston-rod will be affixed precisely in the true centre of the piston, but with a knuckle or joint, as before described, to admit of its self-adjustment, and the greatest possible reduction of friction.

Figs. 4 and 5, represent a plan and section of a double-adjusting balancing valve, being another method of using the excentric hung elliptic valve or piston; the valve *a, b*, being of the larger, and the valve *f, f*, of the smaller area. These valves are connected by the piece W, which works upon a joint M, secured to the frame N, N, but are placed so as to come in contact or bed themselves on the opposite sides of the frame *a, b*, on the lower, and *f, f*, on the upper side.

These two valves are made steam or water tight, upon the surfaces of the frame or bed N, N: by this arrangement both valves open or shut at the same time, and the power required to open them, consists of the difference of their respective areas, multiplied by the pounds in pressure, either of water or steam acting upon them.

The patentees claim the construction of pistons and valves as above described.—[*Inrolled at the Petty Bag Office, May*, 1841.]

To* CHARLES FLUDE, *of Liverpool, chemist, for his invention of improvements in applying heat for generating steam, for general manufacturing, and other useful purposes, where heat is required; and also for an improved mode of supplying steam-boilers with hot water, the said improvements having for their object the economy of steam.—[Sealed 3rd November, 1838.]

THIS invention is described as consisting, firstly, in various improvements made upon his former invention, (see present Vol., p. 352); and secondly, in an improved method of supplying steam-boilers with hot water.

The description of the apparatus and means by which the invention is carried into effect, is described at great length in the specification; we can therefore only give a general idea of the proposed plans, and the claims set forth by the patentee, at the conclusion of his specification.

The improvements herein proposed, are principally certain modifications of and additions to the former patent, by which the heat of a coke oven may be more beneficially applied to the generating of steam. There are above forty figures in the drawing, exhibiting different plans of building coke ovens, in none of which do we perceive any particular feature of novelty.

The patentee proposes to heat the air as it passes through certain flues, beneath and around the oven, and to conduct such heated air into the main flue, for the purpose of consuming smoke. He also divides the oven, and applies distinct furnaces, and places the coal to be coked on ledges over the furnace, which he calls hoppers,

The second feature of improvement, is passing the eduction steam from an engine through a multitude of pipes, by which it becomes condensed, through the refrigerating pro-

perties of the cold air which surrounds the pipes. The condensed vapour, almost at boiling heat, passes from the pipes into the tank, and is thence conducted into the boiler.

This appears to be exactly the same plan as that proposed by Dr. Church, many years ago, in connection with his steam-engines for locomotion.

The specification concludes with a long catalogue of claims, as follow:—

"Firstly,—I claim the mode of dividing coke ovens into two or more compartments, as shewn and described; secondly,—I claim the combination of a coke oven, with a flashing arch or feeding means, as shewn and described; thirdly,—I claim the mode of increasing the heat and burning the smoke of coke ovens, as shewn and described; fourthly,—I claim the combination of common fires and coke ovens; fifthly,—I claim the combination of fire-bars or grates, with a coking hearth or floor; sixthly,—I claim the mode of heating steam-boilers and evaporating vessels, as described, whether the same are furnished with side flues or not, and whether the draft be from front to back, or in any other convenient direction; seventhly,—I claim the general application of the oven to steam-boilers and evaporating vessels, when combined with hoppers or feeding means, or air flues, or both; eighthly,—with respect to the manufacture of glass, pottery, and earthenware,—I claim the general application of the waste heat of coke ovens to the particular purposes aforesaid; ninthly,—I claim the mode of heating glass furnaces by fires, situate beneath the glass furnace, instead of being placed in the furnace itself, as hitherto practised, whether such flues be of the ordinary construction, or any of the constructions above described; tenthly,—I claim the combination of coke ovens, with feeding means, when the heat of such ovens is employed for smelting or manufacturing purposes, or for heating steam-

boilers or evaporating vessels, whether such end be obtained by introducing combustible substances, gas, or any of the means above described; eleventhly,—I claim the mode of constructing furnaces for the combustion of slack or coal, as shewn and described; twelfthly,—I claim the mode of condensing steam, as shewn and described, and thus obtaining hot water for supplying the boilers of locomotive engines on rail-roads or ways; and thirteenthly,—I claim the combination of a close floor or partially close floor, and arch and feeding means or common fires, or both, as herein described, whether the same be employed for making coke or not, so long as the same is used or employed for heating purposes, according to the mode and description above specified and explained."—[*Inrolled in the Inrolment Office, May,* 1839.]

To STEPHEN GEORGE DORDOY, *of Blackman-street, in the Borough of Southwark, in the county of Surrey, chemist, for certain improvements in the manufacture of gelatine, size, and glue.*—[Sealed 31st October 1839.]

THE patentee takes such skins, hides, or other animal substances, as are commonly used for making gelatine, and places them in a proper vessel, covering them with cold water, where they remain some days, until they become slightly putrescent. The skins are then washed in pure cold water, with stampers, or any other convenient machine or engine, until the water runs off clear; after which, they are placed in a wooden, earthen, leaden, or other proper vessel, with a cover fitted to exclude the general atmosphere, and covered with cold water, impregnated with enchlorine, chlorous, or chloric acids, prepared in the manner and proportions as follows:—

For every 100 lbs. weight of the skins, hides, or animal

substances, eight ounces of chlorates or chlorides of lime, potash, soda, barytes, or other similar compounds, are dissolved or thoroughly mixed in, or with two or more gallons of hot or cold water; four pounds of hydrochloric or other acids being added, and stirred thoroughly. This mixture is to be poured into the vessel containing the water and animal substances, the materials being stirred continually while the mixture is added. The animal substances should be kept entirely covered with the impregnated water for twenty-four hours.

These quantities and proportions are found sufficient for 100 lbs. weight of sheep pieces or the skins of such animals as have thin skins; but other animal substances, taken from oxen, calves, or other animals, such as have much flesh or fibre about them, will require to be steeped in the impregnated water two or three times, and for the same number of hours, until they appear of a uniform transparent whiteness; but after each several steeping in such impregnated water, they must be thoroughly washed in fresh cold water, with stampers, or any other convenient machine, until the water runs off clear. All these several immersions are to be continued for twenty-four hours, and after being well washed in cold water, by means of stampers, they are to be put into any convenient wooden, earthen, leaden, or other proper vessel. Water, which has been boiled, and allowed to lower a temperature of about 160° of Fahrenheit's thermometer, is then to be poured on to the skins. The vessel is to be covered, and the temperature of the water kept up to 100° of Fahrenheit, by means of steam, hot air, or any other effectual method; and at the end of from twelve to twenty-four hours, a gelatinous solution will be formed.—The solution of gelatine is then strained off, and passed through woollen or other proper filtering material.

A fresh supply of hot water must now be poured on to

the same skins, hides, or other animal substances, keeping them immersed, and at a temperature of 120° of Fahrenheit. After remaining at such a temperature for a certain time, not exceeding twenty-four hours, a further solution will be obtained; this must be run off and filtered, as before-mentioned. Hot water is again poured on such animal substances, and the temperature raised to 140° of Fahrenheit, at which temperature they are kept for a time not exceeding twenty-four hours. A fresh gelatinous solution being formed, is to be run off, and filtered in the manner before-mentioned.

Fresh hot water is again applied, and kept at such a temperature as will leave the said animal substances at not less than 160° of Fahrenheit; this heat is preserved for a certain time, not exceeding twenty-four hours; the solution is then to be run off and filtered.

The remaining animal substances are boiled with more water, heated by means of steam, or in any other convenient manner, until all the gelatine is apparently dissolved; the solution is then to be drawn off and filtered, as before mentioned.

The patentee claims the use or application of enchlorine, chlorous, or chloric acids, prepared from the chlorates or chlorides of lime, potass, soda, barytes,—or other compounds, from which enchlorine, chlorous, or chloric acid, may be obtained, by the action of hydro-chloric or other acids, in the above or any other proportion,—or in any other manner, for the purposes of the manufacture of the preparations, called gelatine, size, or glue.—[*Inrolled at the Rolls Chapel Office, April,* 1840.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 377, Vol. XIX.)

May 11, 1841.

The President in the Chair.

"On Lead Sheathing for Ships."—By J. J. Wilkinson.

The commencement of this communication, which is the continuation of the paper on the "Wood Sheathing of Ships," which was read March 23d, examines in great detail, the various uses to which metals were put in the earliest period of which any record exists; and then it traces the first application of lead to the protection of shipping.

There are very early instances of ships and vessels being covered with lead.

In the 15th century, a boat, 30 feet in length, was found in the Mediterranean, sunk in 12 fathoms water; it was built of cypress and larch. The deck was covered with paper and linen, and over all with plates of lead, fastened with gilt nails; this covering proved so impervious to moisture, that parts of the interior were perfectly dry. It is supposed to have lain there above 1400 years.

A Roman ship was also found, sunk in the Lake of Nemi. The hull was of larch; bitumen had been applied to the outside, over which was a coating of a reddish colour, and the whole covered with sheets of lead, fastened by gilt nails. The interior had a thick coating of cement, made of iron and clay. The seams of the planks were caulked with tow and pitch.

Some of the ancient domes at Ephesus were sheathed with lead; and it appears that the column of Constantine, at Constantinople, was formerly covered with metal.

It is certain, that lead mines were worked in Britain by the Romans; and long before the Conquest, plates of lead were used

as coverings for ecclesiastical buildings. These coverings being designed to endure, were of very thick lead.

In 1231, water was brought from Tyburn to London in pipes; but the material of the pipes has not been ascertained. In 1285, the great conduit, in Cheapside, was supplied with water, conveyed through pipes from Paddington; these pipes are expressly stated to have been of lead. It has, however, been averred, that lead pipes, for conveying water, were first introduced by Robert Brook, in the reign of Henry the Eighth.

Sheet lead was used in Spain and Portugal, for sheathing ships, and for covering the rudders, long before it was employed in England. It was used in Holland in 1666, and at Venice in 1710.

It is probable, that we are indebted to Sebastian Cabot for its introduction into England; it is stated, in his Memoirs, that he first saw it used in 1514; he was then in the service of the king of Spain, which he entered in 1512, and was appointed pilot major; he afterwards returned to England, and in 1553 was named by Queen Mary, "Governor of the Mysterie and Company of Merchant Adventurers, for the discovery of Regions, Dominions, Islands, and Places, unknown."

Three vessels were fitted out for this purpose, under the command of Sir Hugh Willoughby, one of which was sheathed, or partly so, with thin plates of lead, then first mentioned as an "ingenious invention." This expedition was unfortunate—Sir Hugh Willoughby, with the crew of two of his ships, being frozen to death; one of the commanders, and his crew, alone escaped. This expedition was the origin of the trade to Russia, and of the Spitzbergen Whale Fishery.

In the reign of Elizabeth, a patent was granted to one Humphrey, for melting lead, but was afterwards recalled, the plan not being new.

It appears that, up to about 1670, cast sheet lead was used for sheathing; at that time milled lead was invented, and a patent for milling lead was granted to Sir Philip Howard and Francis Watson; by this process, the inequalities, as well as the defects from air holes, in the former mode of manufacture, were re-

medied; the whole surface was rendered smooth and uniform, and the weight greatly reduced. This invention met with much opposition from the plumbers, who averred that it could not be durable; an offer was therefore made, on the part of the Milled Lead Company, to keep in repair, during forty-one years, all milled lead of the weight of 7 lbs. per square foot, at the rate of five shillings annually per each hundred pounds worth in value.

One of the earliest vessels in the royal navy, thus sheathed, was the Phœnix, a fourth-rate. This was done at the express command of Charles II. This vessel made two voyages to the Straits, apparently for the express purpose of testing the new invention, and on her return in 1673, was careened at Deptford, and personally inspected by the King. An order was then issued, that his Majesty's ships should in future be sheathed only with lead, excepting by especial order from the Navy Board. It appears, that about twenty ships of the royal navy were consequently sheathed with milled lead, and fastened with copper nails,

Even the royal protection could not save this invention from cavillers, so that, in 1677 and 1678, complaints were made by Sir John Narborough and Sir John Kempthorne, that the rudder irons of the Plymouth and the Dreadnought were so much eaten, as to render it unsafe for those vessels to proceed to sea; these complaints were repeated in 1682.

The patentees maintained, on the contrary, that the damage to the rudder irons could not possibly arise from their being covered with lead, as it had been the invariable practice for a great many years, to secure the iron work of ships, generally, by lead covering, and especially by capping the heads of their bolts, under water, with lead, seized to and nailed over them. Reports too in favour of the invention were made by Sir Phineas Pett, and by Mr. Betts, master builder, at Portsmouth, in which the latter stated, that lead had effectually prevented the vessels becoming what is technically termed "iron-sick," meaning that the bolt-holes became so widened by corrosion, that the bolts were loosened; he recommended, however, that the lead sheathing should be stripped every seven years, on account of the decay of

the oakum in the joints; declaring, too, that it became less foul on the voyage than wood sheathing, and was much more easily cleaned. These different opinions led to the issue of an Order in Council in 1682, for the appointment of commissioners to examine and report upon the alleged injury to the iron work by milled lead covering; it is probable their report was unfavourable, as it is said that the use of lead covering, fastened with copper nails, was abandoned on account of the rapid corrosion of the rudder irons. A controversy appears to have arisen on this subject, the merits of which it would be difficult to ascertain after such a lapse of years. Government, however, subsequently determined to make another trial of the value of lead covering; accordingly, the Marlborough was so sheathed, and laid up in ordinary, at Sheerness. A few years after, she was docked, at Chatham, in 1770, when it was found that the lead sheathing was covered with weeds, and the iron fastenings very much decayed; the lead was in consequence removed, and a wood sheathing substituted.

Several patents were afterwards obtained for different mixtures of metal for this purpose, none of which seem to have succeeded, being all subject to the same inconveniences as the simple metal; among which was the influence of the sun in the torrid zone, which was said to reduce the lead, in the course of five or six years, to a calx.

Among these patents, for mixed metals for sheathing, is mentioned that of Mr. Bulteel, in 1693; it was found to have all the inconveniences of lead. Mr. Donithorne, in 1780, obtained a patent for sheathing, of a mixture of 112 parts of tin to 10 parts of zinc; this was also as objectionable as lead.

Slade's patent for sheathing with copper laid upon lead, and the patents of Wetterstedt, and of Muntz, for mixed metals, are examined; and the author promises a continuation of the subject, with the history of copper sheathing.

"Experiments on the strength of Brick and Tile Arches."

By Thomas Cubitt, Assoc. Inst. C. E.

In the course of his extensive building engagements, the author had occasion to construct some fire-proof floors; he therefore wished to ascertain how the greatest omount of strength could be attained, with a due regard to the space occupied, and the cost of the structure.

Two arches were built, each with a span of 15 feet 9 inches, and a rise of 2 feet.

The brick arch was 2 feet wide, and composed of half a brick in thickness, with cement.

The tile arch was 2 feet 4 inches wide, and built of 4 tiles, set in cement, forming a thickness of 4¼ inches.

The spandrels of the arches were filled up level to the crown with rubble work and cement. A load of dry bricks was placed along the centre of both arches, and gradually increased at stated periods, from 12 cwt. 3 qrs. up to 160 cwt. at the end of 75 days, when the abutments of the brick arch gave way; and the tile arch broke down while loading.

The deflection at three points is given in a tabular form; and although, from the circumstances of there having been no tie bars across the arches, the experiments cannot be considered satisfactory, they are valuable, as supplying data hitherto rarely recorded.

Drawings of the arches accompanied the paper.

"Description of a Stone Bridge on the Middlesborough Railway."

By John Harris, M. Inst. C. E.

The bridge described in this communication, is only remarkable for the flatness of the arch, the rise being 5 feet for a span of 30 feet.

A drawing, and the specification of the cost of the work, with a schedule of prices, accompanied it.

"Description of a Bridge built of Blue Lias Limestone, across the Birmingham and Gloucester Railway at Dunhampstead."

By Captain James Vetch, Assoc. Inst. C. E.

The peculiarities in the construction of this bridge, are, that the arch was composed of very small stones, of the blue lias limestone, from three to five inches thick, and squared to about nine inches long and broad; that it was erected without the usual timber centreing, and that the mode of removing the earth centreing precluded any danger from unequal sinking in the arch.

The span of the bridge is 60 feet, with a rise of 10 feet. The material of the cutting where the bridge is situated, consisted of weak slate and clay, consequently the mode of construction was subjected to a severe test.

The abutments being completed to the springing height, the ground was cut away roughly to the form of the arch; seven rows of pegs were then inserted, with their upper ends correctly designing the proper curve; a line of planks, 3 inches thick, was laid transversely beside each row of pegs, and upon them were placed lines of battens on edge, gauged to the exact profile of the bridge; the earth was consolidated, and a flooring of battens laid over all, to form a true bed for the soffits to rest upon.

From the absence of parallelism in the lias stones, their varying thickness, and the difficult adhesion of the mortar, it was deemed necessary to introduce seven transverse bonds of free-stone, which imparted to the whole structure a tendency to settle in the lines of the radii of the arch, and also prevented any rent in the lias masonry from proceeding to a dangerous extent; these free-stone bonds were firmly fastened with iron cramps.

The face had a batter of one in nine, from the springing to the string course, in order to counteract any tendency to bulge towards the faces, or in the line of the least resistance. The base was also extended, and the crown narrowed, which gave a concave form to the string course.

The whole arch being filled in with the full depth of stone work on each springing, and the bonds of free-stone all placed, the

lines of each, between the second and third bonds, were keyed up, and then those between the third and the centre bond, which thus apparently formed the key stone.

The earth centre was removed by cutting a heading 4 ft. 6 in. wide, directly beneath the key stone, and then gradually excavating on either side, uniformly towards the abutments, stopping at certain intervals to allow any settlement to take place. By proceeding thus, as successive portions of the arch were left to their own bearings, regular compression ensued, and a small portion only of the work was exposed to the risk of fracture from inequality of pressure; the rising of the haunches which generally accompanies any undue depression of the crown, appeared by this method to be entirely avoided.

The author ascribes much merit to the careful manner of keying in the courses, as no cracks occurred, and the settlement of the arch did not exceed 2½ inches. He conceives this experiment to have answered completely, as there was a saving of time, the expense of erecting the usual wooden centre was avoided, and the bridge was ready when the railway cutting reached it. He considers that this system may be advantageously used in many situations upon railways, and that the span may be at least double that of the bridge now described.

The communication was accompanied by three drawings, showing the details and progress of the construction.

"Description of the great Aqueduct at Lisbon, over the Valley of Alcantra."

By Samuel Clegg, Jun.

This aqueduct was founded by King John the Fifth in 1713, and completed by the Marquis of Pombal, 1755. It resisted uninjured the shocks of the great earthquake in that year, although it was observed to oscillate considerably.

The most conspicuous part of the work is that which crosses the Valley of Alcantra; it consistes of thirty-two arches, with

spans varying from 50 to 105 feet; the crown of the centre arch is 225 feet from the ground. The length of this portion is 8000 feet.

The sources from which the supply of water is derived, are situated in the high ground in the neighbourhoods of Cintra and of Bellas—they are eighteen in number; one of these tributaries is conveyed by a culvert from a distance of fifteen miles.

The main duct into which the tributary streams empty themselves, forms a tunnel of 6 feet wide, and 7 feet high, ventilated by vertical shafts, at distances of a quarter of a mile apart.

The channels for the water are made with "drain tiles," 12 inches wide and 9 inches deep, open at the top.

After passing over the great aqueduct, the main duct runs under ground for half a mile, and is carried across the "Estrada do arco Cavalho" on seven arches, of 40 feet span each, on the south side of which it continues beneath the surface until it reaches the aqueduct of "Agua Livres," in Lisbon, and empties itself into the reservoir at its termination.

This reservoir is 60 feet long, by 54 feet wide, and 27 feet deep. The quantity of water contained in it, when the author took the measurements, was 64,800 cubic feet. He was unable to obtain a section of the retaining walls, but supposed them to be about 23 feet in thickness.

The pipes through which the water is distributed to the neighbouring fountains, are of earthenware and stone, set in mortar. The velocity of its flow through the main duct is 75 feet per minute. The quantity discharged is about 73,000 gallons in twenty-four hours, during the winter months.

The particulars relating to the construction of the aqueduct, the author translated from the documents preserved at the Office of Public Works, in Lisbon.

The foundations were laid in May, 1713, and the piers, which in common with the rest of the work, are of grey marble, carried up without footings. They are faced with ashlar work, in courses, from 1 foot 6 inches to 2 feet deep. The stones are dowelled together with bronze and iron; the centre portion of each pier is

filled in with rubble masonry, to within 30 feet of the top, above which it is left hollow.

The voussoirs of the principal arch, to which the author more particularly refers, are carefully jointed, their thickness being, on an average, 8 feet at the springing, and 5 feet on the square at the crown.

The figure of the arches is pointed Gothic, the rise being 7-tenths of the span.

The spandrels are of closely-jointed ashlar work, about 2 feet 6 inches in thickness.

The backings are filled in with rubble, quite solid; nor is there any provision made for the drainage.

The mortar used was made with lime from the grey marble of the neighbourhood, and sharp *sea sand*, in the proportions of one of the former to four of the latter.

No mechanical contrivances were used for hoisting the blocks of marble, but they were slung upon poles from men's shoulders, and carried up a series of inclined planes to the height required.

Some or these blocks weighed upwards of three tons.

The scaffolding and inclined planes, erected round the piers, were of a very substantial description.

The lower parts were trussed framings, formed of double Riga or Dantzic timbers, 15 inches square, fastened together with trenails of teak and chesnut. The inclined planes had a rise of about 1 foot in 6 feet, with a level space at each end of the pier to serve as a resting place, where a separate gang of men received the stone block, and relieved the others.

The ends of the upright timbers of the scaffolding were not suffered to be surrounded by earth or moisture, but were placed upon blocks of stone, bedded firmly and evenly upon the rock, and kept well tarred. The struts and braces retaining them, were also secured from decay in the same manner. These precautions were necessary, not only from the great weight they had to support, but from the length of time they remained in use—not less it is supposed than thirty years.

The centreing for the arches was constructed by an Italian architect, named "Antonio Davila."

The arches were commenced from each side of the valley at the same time, and a temporary gang-way erected over them as they proceeded, so that the inconvenience of raising the material from the bed of the valley was avoided.

The centreings were framed in their places. The cradles which supported the bearing timbers of the lower truss, were morticed into sleepers, resting upon projecting stones, left for the purpose; those on the same pier were secured by cross timbers, so as to balance each other. The lower framings were first fixed and secured by straining pieces, and the upper portion erected afterwards, in the manner of a roof principal. All the scarfs were cut vertically, fastened by trenails of teak, and but little iron was used in any part of the structure.

The striking wedges were placed under each voussoir, as in the French centreings.

As the arch rose from the springing, the crown of the centreing was loaded with stones, to prevent it rising and altering the shape of the arch.

The cost of the entire aqueduct, which was about 21 miles long, with all the immediate and collateral works, and including the reservoir, was two millions and a half sterling.

The communication was accompanied by three elaborate drawings of the general construction and details of the aqueduct, with the manner of carrying the stones.

May 18, 1841.

The President in the Chair.

"On Sea Defences, constructed with Peat-Moss."

By the Hon. Montgomery Stuart.

In the commencement of this communication, the author refers to the early period at which the art of reclaiming land from the

sea was practised, and to the extensive districts both in Britain and on the continent, where sea defences of various kinds are constantly in course of construction. He then proceeds to detail the modes suggested by the experience of many years, and practised by him in constructing sea defences in the Bay of Wigtown, for the protection of the estate of his brother, the late Earl of Galloway.

The whole of the district abounded with peat-moss, possessing many properties which rendered it, independent of its cheapness, a peculiarly valuable material for constructing embankments to resist the action of the sea. Its tough fibrous nature, its elasticity, and at the same time the rapidity with which the mass became solid, were useful qualities which he sought to take advantage of. He found also that it possessed advantages as a material for puddling; as from its absorbent nature, it imbibed and retained all the moisture that approached it, and never cracked from dryness, as occurs so frequently with clay puddle. In case also of holes being made in the puddle, either by vermin or external injury, they soon closed again from the elastic nature of the peat-moss, and its tendency to grow together

The author sometimes uses peat-moss as a puddle between two ranges of stone walls, and sometimes as a backing instead of clay-sod; but he more particularly recommends it as a backing to a stone defence, parallel with the shore. For this purpose, the turf should be cut thin, placed against the bank, and the stone-work built against it; he has found this the most durable and effectual defence against the sea; the action of the waves against it, even adding to its security, as from its fibrous nature, it retains the silt thrown against the wall, until all the interstices between the stones are completely filled, and a defence is thus formed for the wall itself by the accumulation against it.

The method he employs, is to build the sea-wall of rough rubble stone, laid dry, with a slope of about two to one; the peat-moss backing, cut into blocks, rather thicker than usual, is laid in courses, well bonded and beaten together; it is thus consolidated throughout the height of the wall. Upwards of twenty

years have elapsed since some of the first embankments were made on this principle; they have perfectly answered the purpose, and have been the means of effectually reclaiming a great extent of valuable land.

The author also states, that he has lately been occupied in forming a defence, by warping silt, with whin or gorse kids, laid horizontally; a method which he prefers to that practised in Lincolnshire, where the kids are placed upright. He keeps the kids in their positions by means of stones laid on them, which are removed as the surface rises; fresh kids are then added, and the stones relaid.

The communication is accompanied by three sections of the sea defences, as they are executed, and by some corroborative testimony as to their efficiency, by Mr. Lewin, of Boston, who has examined and reported upon them.

Full instructions are also given for constructing the different kinds of defences mentioned.

"An account of the repairs done to the Beechwood Tunnel, upon the London and Birmingham Railway, September 1840."

By Thomas M. Smith, Grad. Inst. C. E.

The tunnel is built of brick,—is 302 yards long, and passes through strata consisting of alternate layers of rock and marle, abounding in springs of water; it was completed at the latter end of the year 1837; that winter being of unusual severity, many of the bricks were partially destroyed, owing to their containing lime, upon which the weather acted. Mr. Robert Stephenson first contemplated applying a coat of cement throughout the inside of the arch, but it was apprehended that it would not adhere, in consequence of the constant dripping of water.

No positive steps were, however, taken until the effects of the winter of 1839-40 had so injured the brick-work as to render further delay dangerous; it was then resolved to line the whole length of the tunnel with an interior brick arch, 9 inches thick, so as to support and insure the stability of the old work.

For the purpose of executing the work with facility, all the trains of carriages were diverted upon the down-line through the tunnel, and for a quarter of a mile at each end; no up-train was allowed to pass upon the single line, while a down-train was in sight: a hoarding was then erected between the lines of railway throughout the length of the tunnel, to protect the workmen, and to prevent the building materials from interfering with the trains.

The internal casing of brick-work, 9 inches thick, of English bond, was then carried up one side to the height of 4 feet 9 inches above the springing: a course of York paving, $4\frac{1}{2}$ inches thick, was at this point bonded into the old work, and the new work was securely attached beneath the stone bond course by iron wedges, and regular half brick toothings were inserted, at intervals of 2 feet 3 inches apart, in chases cut into the old work; by these precautions the new work was secured from being detached, and from falling upon the passing trains.

One side being finished throughout its entire length, the trains were turned upon the up-line, and the same mode of proceeding followed with the other side. A series of bearers, 6 feet apart, were then placed over head, and a close flooring laid so as to serve for scaffolding for the workmen, and to prevent the building materials from falling upon the rails. A pair of ribs were then raised upon each bearer, and keyed with a strut, 7 inches below the crown of the arch; the supporting stays were fixed, the laggans laid upon the ribs, and the brick-work of the arch was constructed in English bond throughout the whole length, and on both sides of the tunnel, simultaneously, to within 2 feet of the crown; a moveable centre, 2 feet 3 inches long, was then introduced, and the arch was closed in with two half brick rings.

The whole of the work was done with blue hard burnt Staffordshire bricks, laid in cement and sand, in equal proportions, for the side walls; for the arch, up to within 15 inches of each side of the crown, two-thirds of cement, and one-third of sand; the two rings for keying up the centre or crown, were laid entirely in cement, without any mixture of sand.

Previous to commencing the new work, a series of chases were

made in the old wall, which, when closed in front, by the lining arch, formed drains, 4½ inches square, terminating in the culvert beneath the centre of the railway, and conveying thither all the water which would otherwise have separated the new from the old brick-work.

This work was finished, and the scaffolding removed, within the short space of forty days, by Messrs. Grissell and Peto, under the direction of Mr. Robert Stephenson, and the immediate superintendence of Mr. Dockray.

This communication was accompanied by a drawing, showing the details of the scaffolding, and the mode of construction.

[*To be continued.*]

Scientific Adjudication.

VICE CHANCELLOR'S COURT,

December 16*th*, 1841,

Before SIR LAUNCELOT SHADWELL.

Muntz *v.* Vivian and Walker.

This was a motion for an injunction on behalf of Mr. F. Muntz, M. P. for Birmingham, Mr. C. P. Grenfell, and Mr. R. W. Grenfell, to restrain the defendants, who represent "Harford's Brass Battery Company," at Bristol, from making, using, or vending, a combination of metals, for which a patent was granted to Mr. Muntz, on the 22nd of October, 1832, under the title of "an improved manufacture of metal plates, for sheathing the bottoms of ships and other vessels." The use of this alloy of metals was further secured by a patent subsequently obtained on the 17th December, "for an improved manufacture of bolts and other the like ships' fastenings." *

The counsel for the plaintiffs were Mr. Bethell, Mr. Rotch, and Mr. Hetherington:—for the defendants, Mr. Richards and Mr. Osborne appeared.

* For the Specifications of these Patents, see Vol. III. of our Conjoined Series, Pages 83 and 212.

The invention was stated by the specification, to consist in making the plates for sheathing of an alloy of zinc and copper, in such proportions, as while it enabled the manufacturer to roll the compound into plates fit for sheathing at a red heat, so that the plates were less difficult to work, it also rendered the sheathing less liable to oxidation, and more durable than the ordinary copper sheathing, though at the same time, it oxided sufficiently to keep the bottom of the vessel clean. For this purpose, the patentee took what is termed the "best selected copper" and "foreign zinc," and melted them together in any proportions between 50 per cent. of copper and 50 per cent. of zinc, and 63 of copper and 37 of zinc, both of which extremes, and all intermediate proportions, would roll at a red heat; but, inasmuch as too large a proportion of copper increased the difficulty of working, and too large a quantity of zinc rendered the metal too hard when cold, the alloy was preferred to consist of about 60 per cent. of copper and 40 of zinc. This compound was cast into ingots, of any convenient weight, and then heated to a red heat, and rolled in the same method that copper was rolled hot, taking care not to overheat the metal so as to produce fusion; and then it was put through the roller, after the heat had passed off, so as to prevent its splitting. The sheets, after finishing, were well annealed and cleaned with a mixture of sulphuric acid and water.

The specification admitted that the alloy might be compounded in a different way, such as by cementing calamine and copper, in certain proportions, and by employing brass rolled out,—but it rendered the application of red heat necessary in these cases, and the expense was stated to be infinitely greater.

The defendants admitted they had made use of a compound, the proportions of which were within the limits of the plaintiff's specification, but had not employed red heat in the process. This mode of manufacture they stated had been generally known and made use of by themselves before the date of the plaintiff's patent, and therefore it was defective in point of novelty; and the mere application of it to the sheathing of ships was not such a new use of a common and known principle as the court would protect.

The question, therefore, chiefly depending on the novelty and utility of the invention, a number of affidavits, of eminent persons in the shipping trade, were read in support of the validity of the patent in these particulars, including one by Bayley, the shipwright and surveyor of Lloyd's. It was also relied on by the plaintiff, as a proof that the combination used by the defendants had been taken from the plaintiff's patent, that their old and imperfect method of manufacturing sheathing for ships' bottoms was varied, and the principle of the plaintiff's invention adopted, immediaiely after the patent was granted.

The defendants' case mainly rested on the evidence of Mr. Herapath, an eminent chemist at Bristol, and Mr. Mortimer, a brass-founder at Keynsham, Somerset, who stated they had made several experiments, at the request of the defendants, upon the method described in the specification, and found that in each of them, where the rolling took place when the metal was hot, it was invariably found to split at the edges; and, as it was shown by these gentlemen, in connection with these experiments, that the combination of the proportions in the plaintiff's specification was to be found as long ago as 1788, in *Bishop Watson's Essays*, the *Encyclopædia Britannica* in 1810, *Chambers' Dictionary*, *Thomson's Chemistry*, and other well known works on the subject, to have been in general use, and applied to all sorts of vessels and door plates; and as, moreover, the only novelty was the use of heat, which was found to fail, the defendants insisted they were fully entitled to use the combination of the proportions they had used, when the metal was rolled in a cold state, whether it came within the terms of the plaintiff's specification or not.

Mr. Muntz stated, in affidavit, in reply,—that in the experiments made by Mr. Herapath, an allowance of from $1\frac{3}{4}$ to 2 per cent. had not been made in the zinc used, and hence the experiments, which did not thus come within his limits, had failed.

The Vice Chancellor said he should refrain from giving any opinion on the validity of the plaintiff's patent, because there had been such a possession of apparent right, that the court would interfere, if a clear infraction had been made out, by putting the plaintiff to bring an action at law, that the validity of the patent

might be determined.—But he doubted very much whether the use of heat in rolling the metal, was not made part of the thing for which the patent was granted. The defendants represented, that whatever proportions were used when the metal was rolled hot, it was invariably found to split. Then they stated a variety of experiments, to show there own course was the best, and that they never once, in the course of eleven years, except when making these experiments, rolled the combination in a state of heat. If this were so, the question was, whether there had been any violation of the patent, and also whether the method in which the sheathing was required to be made by the plaintiff, was not when the metal was hot. His Honour then examined the language of the specification, and said his mind was strongly impressed with this, that wherever the plaintiff described the manner in which the invention was to be performed, by means of which the compound metallic substance was to be fabricated, "heat" or "red heat" was always a necessary ingredient. That being so, the alleged infraction came to this,—that the defendants had used the very proportions of the plaintiff, but had taken care heat should not be the ingredient employed, when it came to be rolled. He doubted, therefore, whether what the defendants had done, was a sufficient case of invasion in which the court could interfere, and was of opinion that all he could do, was not to make an order refusing the motion, but to let it stand over, and direct the plaintiff forthwith to bring such action as he shall be advised, to try the validity of the patent,—giving both parties liberty to apply to the court in the meantime.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th November to the 17th of December, 1841, inclusive.

To Martyn John Robert, of Brynycaeran, in the county of Caermarthen, Gent., and William Brown, of the City of Glasgow, merchant, for improvements in the process of dyeing various matters, whether the raw material of wool, silk, flax, hemp,

cotton, or other similar fibrous substances,—or the same substances in any stage of manufacture; and in the preparation of pigments or painters' colours.—Sealed 15th November.

Joseph Clisild Daniell, of Tiverton Mills, near Bath, for improvements in the manufacture of manure, or a composition to be used on land as a manure.—Sealed 18th December.

Robert Logan, of Blackheath, in the county of Kent, Esq., for improvements in obtaining and preparing the fibres and other products of the cocoa-nut and its husk.—Sealed 18th December.

In our previous List of Irish Patents, for "Richard Laurence, *of* Sturtevant," read "Richard Laurence Sturtevant."

List of Patents

Granted for SCOTLAND, subsequent to November 22nd, 1841.

To George Low, of Finsbury-circus, London, civil engineer, for improved methods of supplying gas, under certain circumstances, and of improving its purity and illuminating power.—Sealed 24th November.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for certain improvements in the production of ammonia,—being a foreign communication.—Sealed 1st December.

James Balderston, of Paisley, manufacturer, for certain improvements in machinery or apparatus for doubling, twisting, twining, and finishing cotton and other fibrous substances.—Sealed 7th December.

James Colman, of Stoke Holy Cross, Norfolk County, starch manufacturer, for improvements in the manufacture of starch. —Sealed 10th December.

Alexander Sparkes, of Birmingham, artist, for certain improvements in the production of works of art, in metal, by electric deposition.—Sealed 10th December.

William Irving, of Princes-street, Rotherhithe, for improvements in the manufacture of bricks and tiles.—Sealed 10th December.

George Hickes, of Huddersfield, agent, for an improved machine for cleaning or freeing wool and other fibrous materials, of burs and other extraneous substances.—Sealed 10th December.

Joseph Needham Tayler, of Devonport, post-captain, for a certain method or certain methods of abating or lessening the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state, known by the term "broken water," and thereby preventing the injury done to, and increasing the durability of, break-waters, mole-heads, piers, fortifications, light-houses, docks, wharfs, landing-places, embankments, bridges, or pontoon bridges; and also of adding to the security and defence of harbours, roadsteads, anchorages, and other places, exposed to the violent action of the waves.—Sealed 11th December.

Robert Holt, of Manchester, cotton spinner, and Robinson Jackson, also of Manchester, engineer, for certain improvements in machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids.—Sealed 11th December.

William Hill Darker, Sen., and William Hill Darker, Jun., both of Lambeth, London, engineers; and William Wood, of Wilton, carpet manufacturer, for certain improvements in looms for weaving.—Sealed 14th December.

Archibald Templeton, of Lancaster, silk-spinner, for a new or improved method of preparing for spinning, silk and other fibrous materials.—Sealed 16th December.

James Colley March, of Barnstable, surgeon, for certain improved means of producing heat from the combustion of certain kinds of fuel.—Sealed 16th December.

Christopher Dumont, of Mentz, now residing at Mark-lane, London, for improvements in the manufacture of metallic letters, figures, and other devices,—being a communication.—Sealed 16th December.

Morris West Ruthven, of Rotherham, engineer, for a new mode of increasing the power of certain medea, when acted upon by rotary fans or other similar apparatus.—Sealed 16th December.

Henry Augustus Wells, of Regent-street, London, for improvements in machinery for driving piles,—being a foreign communication.—Sealed 17th December.

Henry Booth, of Liverpool, for improvements in the method of propelling vessels through water.—Sealed 17th December.

John Hall, of Breezes Hill, Ratcliff Highway, London, sugar refiner, for improvements in the construction of boilers for generating steam, and in the application of steam to mechanical power.—Sealed 17th December.

Henry Browne, of Codner Iron Works, Derbyshire, iron manufacturer, for improvements in the manufacture of steel.—Sealed 18th December.

William Newton, of the Office for Patents, 66, Chancery-lane London, for certain improvements in engines, to be worked by gas, vapour, or steam,—being a foreign communication.—Sealed 20th December.

New Patents
SEALED IN ENGLAND.
1841.

To Robert Wilson, of Sowerby-bridge, Halifax, currier and tanner, for improvements in the manufacture of leather.—Sealed 2nd December—6 months for inrolment

William Irving, of Princes-street, Rotherhithe, Gent., for improvements in the manufacture of bricks and tiles.—Sealed 7th December—6 months for inrolment.

James Colman, of Stoke Holy Cross, Norfolk, starch manufacturer, for improvements in the manufacture of starch.—Sealed 9th December—6 months for inrolment.

William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., for

improvements in coating or covering metals with other metals, and in colouring metallic surfaces.—Sealed 9th December—6 months for inrolment.

John Hall, of Breezes Hill, Ratcliff Highway, sugar refiner, for improvements in the construction of boilers for generating steam, and in the application of steam to mechanical power.—Sealed 9th December—6 months for inrolment.

Archibald Templeton, of Lancaster, silk spinner, for a new or improved method of preparing for spinning, silk and other fibrous substances.—Sealed 9th December—6 months for inrolment.

Jonathan Guy Dashwood, of Ryde, Isle of Wight, plumber, for improvements in the construction of cocks and taps.—Sealed 9th December—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Gent., for improvements in the construction of masts for ships and vessels, and in applying the shrouds,—being a communication.—Sealed 9th December—6 months for inrolment.

Josiah Taylor, of Birmingham, brass-founder, for improvements in the construction of lamps.—Sealed 9th December—6 months for inrolment.

Robert Henderson, of Birmingham, china dealer and glass stainer, for certain improvements in apparatus for heating and lighting apartments, and for other like purposes.—Sealed 9th December—6 months for inrolment.

Henry Wilkinson, of Pall Mall, gun-maker, for improvements in machinery, to be used in constructing buildings, and in raising and lowering weights and materials,—being a communication.—Sealed 9th December—6 months for inrolment.

John Edwards, of Shoreditch, warehouseman, for improvements in giving signals on railways.—Sealed 11th December—6 months for inrolment.

William George Henry Taunton, of Liverpool, engineer, for improvements in machinery for raising weights.—Sealed 11th December—6 months for inrolment.

William Westley Richards, of Birmingham, gun-maker, for im-

provements in the construction of gun and pistol locks and primers, for the discharge of fire-arms.—Sealed 14th December—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in printing or delineating patterns on painted cloths for floor-cloths, covers, and other uses,—being a communication.—Sealed 14th December—6 months for inrolment.

Francis Marx, of 81, Eaton-square, Esq., for certain improvements in the construction of ships or other vessels, and the method of propelling them,—being a communication.—Sealed 16th December—6 months for inrolment.

William Neilson, builder,—David Lyon, builder,—and Peter Mc Onie, engineer, all of Glasgow, for a mode or modes of, or an improvement or improvements in, cutting, dressing, preparing, and polishing stones, marble, and other substances; and also in forming flat or rounded mouldings and other figures thereon. —Sealed 16th December—6 months for inrolment.

Charles Edward Austin, of Fulham, engineer, for an apparatus for what is commonly called "changing the line on railways." —Sealed 16th December—6 months for inrolment.

James Stewart, of Osnaburgh-street, Regent's-park, piano-forte maker, for an improvement in the construction of castors.— —Sealed 16th December—6 months for inrolment.

William Prowett, of Northamptonshire, victualler, for improvements in giving signals on railways.—Sealed 16th December—6 months for inrolment.

Henry Booth, of Liverpool, Esq., for improvements in the method of propelling vessels through water.—Sealed 16th December—6 months for inrolment.

John Norton, of the Junior United Service Club, Regent-street, Esq., for improvements in sheathing ships and other vessels.—Sealed 16th December—6 months for inrolment.

Antoine Mertens, of the London Coffee House, publisher, for improvements in the manufacture of plaited fabrics.—Sealed 16th December—6 months for inrolment.

William Church, of Birmingham, civil engineer, and Jonathan Harlow, of the same place, manufacturer, for certain improvements in the mode of manufacturing metallic tubes, and in the mode of joining them or other tubes or pieces, for various useful purposes.—Sealed 16th December—6 months for inrolment.

Thomas Starkey, of Birmingham, copper cap manufacturer, for improvements in percussion caps for discharging fire-arms.—Sealed 16th December——6 months for inrolment.

John Americus Fanshawe, of Hatfield-street, Christ Church, Gent., for an improved manufacture of water-proof fabric, applicable to the purposes of covering and packing bodies, buildings, and goods, exposed to water and damp.—Sealed 16th December—6 months for inrolment.

William Buckwell, of Trinity-street, Borough, civil engineer, for improvements in scaffolding or frame-work, for building purposes.—Sealed 16th December—6 months for inrolment.

Charles Loosey, of Half-moon-street, Piccadilly, civil engineer, for improvements in steam-engines, and which improvements are also applicable in raising or forcing water, and propelling vessels.—Sealed 16th December—6 months for inrolment.

John Bould, of Ovenden, Halifax, cotton spinner, for an improvement or improvements in condensing steam-engines.—Sealed 16th December—6 months for inrolment.

Antoine Jean François Claudet, of High Holborn, glass merchant, for certain improvements in the process or means of, and apparatus for, obtaining images or representations of nature or art.—Sealed 18th December—6 months for inrolment.

Henry Hough Watson, of Bolton-le-Moors, Lancaster, consulting chemist, for certain improvements in dressing, stiffening, and finishing cotton, and other fibrous substances, and textile and other fabrics,—part or parts of which improvements are applicable to the manufacture of paper, and also to some of the processes or operations connected with printing calicoes and other goods.—Sealed 21st December—6 months for inrolment.

William Edward Newton, of the Officc for Patents, 66, Chancery-lane, civil engineer, for certain improvements in lamps and burners, and in the means of supplying air and heat thereto, for the support of combustion,—being a communication.—Sealed 21st December—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in cleansing wool, and facilitating the operation of dyeing; and also in washing and bleaching cotton yarns or fabrics,—being a communication.—Sealed 21st December—6 months for inrolment.

Ovid Topham, of Whitecross-street, engineer, for improvements in engines, machines, apparatus, or means for extinguishing or stopping the progress of fire in any room or part of different buildings, which may have become ignited, such as noblemen or gentlemen's mansions, houses, factories, store and warehouses, and consequently preserving them from destruction, and preventing the loss of life.—Sealed 21st December—6 months for inrolment.

Ceorge Palmer Henry, of Peckham, chemist, for improvements in apparatus, to be applied to the glass chimneys of gas burners.—Sealed 21st December—6 months for inrolment.

John Cox, of Gougie Mills, Edinburgh, tanner and glue-maker, for certain improved processes of tanning.—Sealed 21st December—6 months for inrolment.

John Oliver York, of Upper Coleshill-street, Eaton-square, engineer, for improvements in the construction of railway axles and wheels.—Sealed 21st December—6 months for inrolment.

William Carron, of Birmingham, lathe-maker, for improvements in the construction of clogs and pattens.—Sealed 21st December—6 months for inrolment.

William Henry Smith, of Finsbury Chambers, Bloomfield-street, civil engineer, for certain improvements in the construction and manufacture of connectors or fastenings, applicable to garments, and other uses.—Sealed 21st December—6 months for inrolment.

Adolphe Fourment, of Museum-street, engineer, for improvements in castors for cabinet furniture, and other purposes.—Sealed 21st December—6 months for inrolment.

Thomas Wright, of Church-lane, Chelsea, Lieutenant in the Royal Navy, and Alexander Bain, of Percival-street, Clerkenwell, mechanist, for improvements in applying electricity to control railway engines and carriages, to mark time, to give signals, and print intelligence at distant places.—Sealed 21st December—6 months for inrolment.

Henry Alphonse Bonnevialle Bouveiron, of Trevor-square, merchant, for improvements in axletrees,—being a communication.—Sealed 21st December—6 months for inrolment.

William Burge, of Bristol, sign painter, for improvements in propelling vessels.—Sealed 21st December—6 months for inrolment.

William Carr Thornton, of Cleckheaton, machine-maker, for certain improvements in machinery or apparatus for making cards for carding cotton and other fibrous substances.—Sealed 21st December—6 months for inrolment.

John Watson, of Chorley, Lancaster, Gent., for improvements in the construction of filters, used in the manufacture of sugar.—Sealed 23rd December—6 months forinrolment.

William Baillieu, of Gloucester-street, Queen-square, Bloomsbury, musician, for improvements in apparatus, to expand the human chest.—Sealed 23rd December—6 months for inrolment.

CELESTIAL PHENOMENA for January, 1842.

D.	H.	M.	
1			Clock before the sun 3m. 51s.
	—		☽ rises 10h. 7m. A.
	—		☽ passes mer. 3h. 38m. M.
	—		☽ sets 10h. 17m. M.
	—		Occul p^4 Leonis im. 12h. 4m.
2	9	1	☿ in Aphelion
	12	22	☿ in conj. with ♃ diff. of dec. 1. 15. S.
3	10	8	☽ in □ or last quarter.
4	5	48	☿ in conj. with ♄ diff. of dec. 1. 15. S.
5	—		Clock before the sun 5m. 42s.
	—		☽ rises 2h. 11m. M.
	—		☽ passes mer. 6h. 52m. M.
	—		☽ sets 11h. 23m. A.
6	18	38	Ceres in □ with the ☉
7	14	6	♀ in the descending node
8	13	48	♀ in conj. with ♃ diff. of dec. 0. 10. S.
9	20	33	♃ in conj. with the ☽ diff. of dec. 2. 20. N.
	23	27	♀ in conj. with the ☽ diff. of dec. 1. 59. N.
	23	57	♄ in conj. with ☽ diff. of dec. 2. 42. N.
10			Clock before the sun, 7m. 50s.
	—		☽ rises 7h. 35m. M.
	—		☽ passes mer. 11h. 11m. M.
	—		☽ sets 2h. 51m. A.
	4	45	♀ in conj. with the ♄ diff. of dec. 0. 45. S.
	19	50	☿ in conj. with the ☽ diff. of dec. 0. 35. S.
11			☉ eclipsed invis. at Greenwich.
	4	15	Ecliptic conj. or ○ new moon.
13	15		☽ in Apogee.
15			Clock before the sun, 9m. 45s.
	—		☽ rises 9h. 22m. M.
	—		☽ passes mer. 2h. 54m. A.
	—		☽ sets 8h. 39m. A.
	5	9	♂ in conj. with the ☽ diff. of dec. 4. 34. S.
16	5	8	Vesta □ with the ☉
	10	51	Her. in conj. with the ☽ diff. of dee. 5. 28. S.
17			Mercury R.A. 19h. 58m. dec. 22. 46. S.
	—		Venus R. A. 19h. 8m. dec. 22. 55. S.
	—		Mars R. A. 22h. 42m. dec. 9. 11. S.
	—		Juno R. A. 15h. 59m. dec. 10. 54. S.
	—		Pallas R. A. 23h. 15m. dec. 9. 43. S.
	—		Ceres R. A. 1h. 20m. dec. 0. 45. N.
	—		Vesta R. A. 1h. 47m. dec. 4. 22. N.

D.	H.	M.	
	—		Jupiter R. A. 18h. 30m. dec. 23. 10. S.
	—		Saturn R. A. 18h. 34m. dec. 22. 35. S.
	—		Georg. R. A. 23h. 29m. dec. 4. 5. S.
	—		Mercury passes mer. 0h. 12m.
	—		Venus passes mer. 23h. 23m.
	—		Mars passes mer. 2h. 55m.
	—		Jupiter passes mer. 22h. 41m.
	—		Saturn passes mer. 22h. 45m.
	—		Georg. passes mer. 3h. 43m.
	1	9	☿ in Sup. conj. with the ☉
19	9		☽ in □ or first quarter.
	—		Clock before the sun, 11m. 22s.
	—		☽ rises, 10h. 34m. M.
	—		☽ passes mer. 6h. 29m. A.
	—		☽ sets 1h. 23m. M.
21			Occul *b* Pleiadum im. 12h. 31m. em. 13h. 30m.
	—		Occul *c* Pleiadum im. 13h. 13m. em. 13h. 40m.
	—		Occul *d* Pleiadum im. 13h. 16m. em. 13h. 55m.
	—		Occul *n* Tauri, im. 13h. 38m. em. 14h. 31m.
	—		Occul *k* Pleiadum, im. 14h. 18m. em. 15h. 9m.
	—		Occul *f* Pleiadum, im. 14h. 20m. em. 15h. 5m.
22	19	39	☿ greatest Hel. Lat. S.
23			Occul 125 Tauri, im. 7h. 37m. em. 8h. 23m.
25			Clock before the sun, 12m. 40s.
	—		☽ rises, 3h. 2m. A.
	—		☽ passes mer. 11h. 28m. A.
	—		☽ sets, 7h. 0m. M.
	9	38	♃ in conj. with ♄ diff. of dec. 0. 32. N.
26			Occul o^2 in Cancri im. 10h. 43m. em. 11h. 42m.
26			☽ eclipsed.
	—		First contact with the Penumbra at 3h. 15m.
	—		First contact with the shadow, 4h. 17m.
	—		Middle of Eclipse, 5h. 43m.
	—		Last contact with the shadow, 7h. 9m.
	—		Last contact with the Penumbra 8h. 11m.
	—		Magnitude of the Eclipse,—(moon's dia.=1.,) 0·792. on the northern limb.
	—		At Greenwich, the moon will rise, 4h.34m. partially eclipsed
	5	49	Ecliptic oppo. or ○ full moon
	14		☽ in Perigee.
29	21	49	Her. in conj. with Pallas

Jupiter's Satellites are not visible until the 18*th of this Month, Jupiter being too near the Sun.*

J. LEWTHWAITE, Rotherhithe.

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Rostron's improved loom

Fig.1

Fig.2

Fig.3

Fig.5

Fig.4

Fig.10

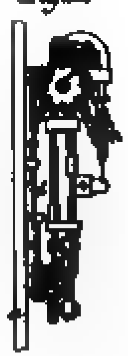


Fig.9

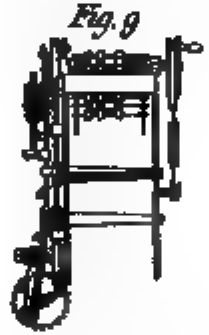


Fig.6

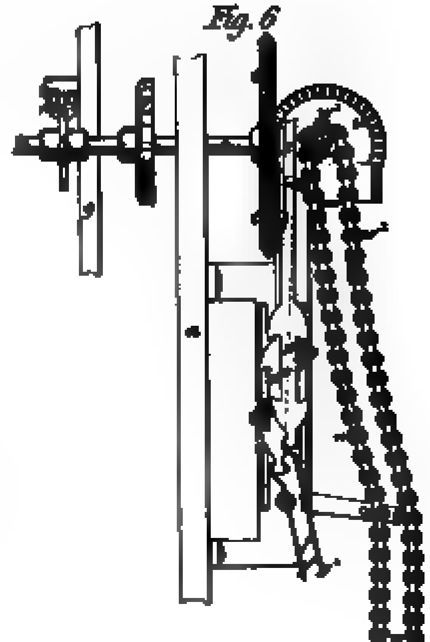


Fig.7

Fig.8

[illegible] Del^t

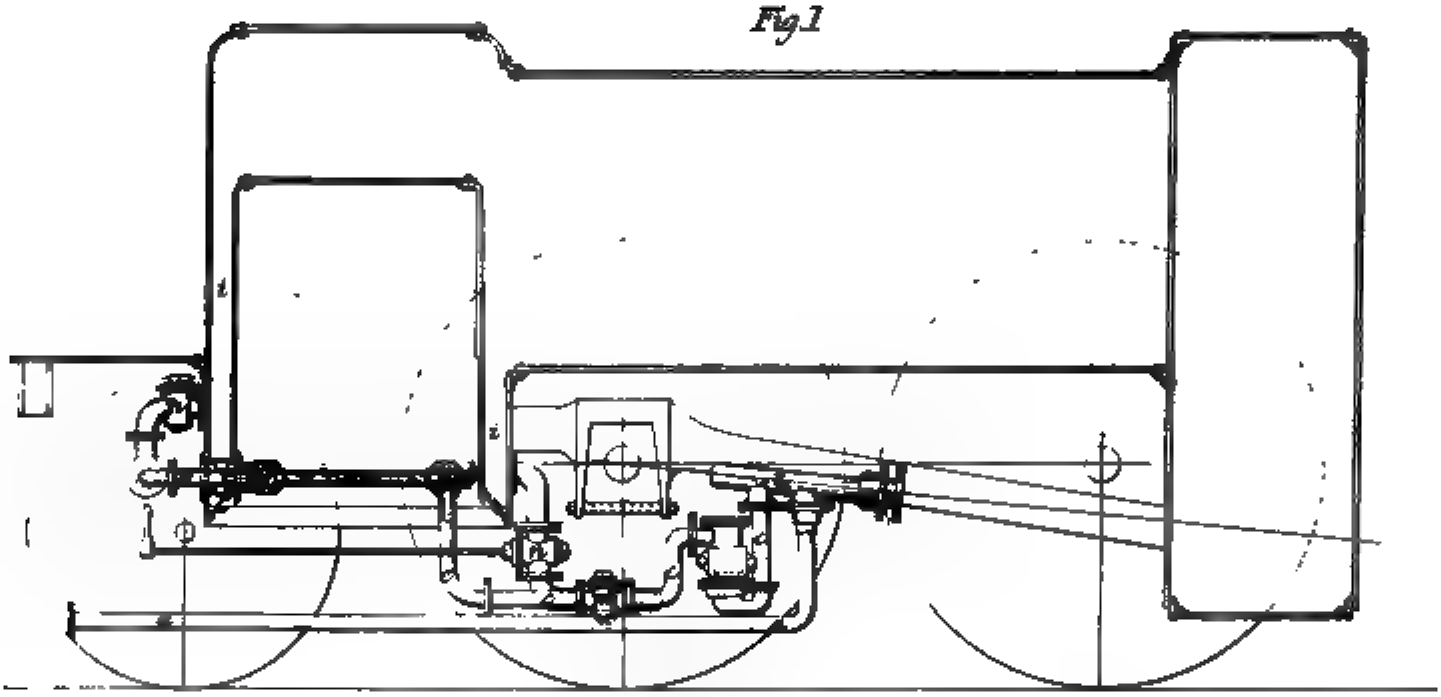
1st August 18[illegible]

W.A. Beever Sculp^t

Fig 2

Imp^ts in steam Engines

Fig.1



power

Keel's Imp^d Valve

Fig.1

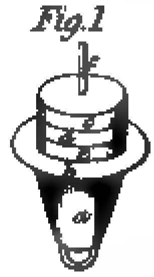


Fig 2

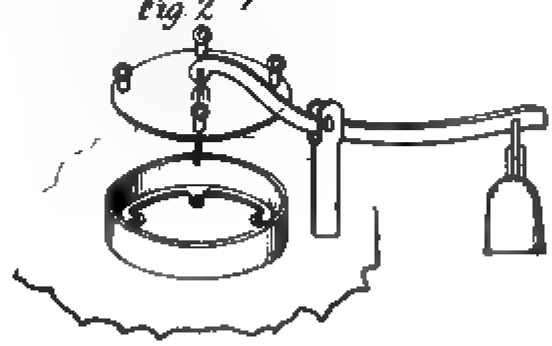
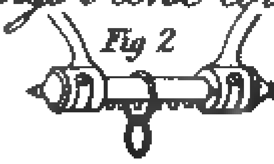


Fig 3

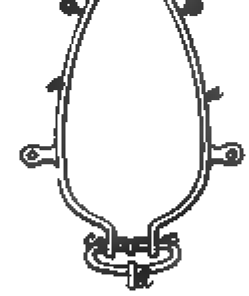
Ridding's Horse collars

Fig 2



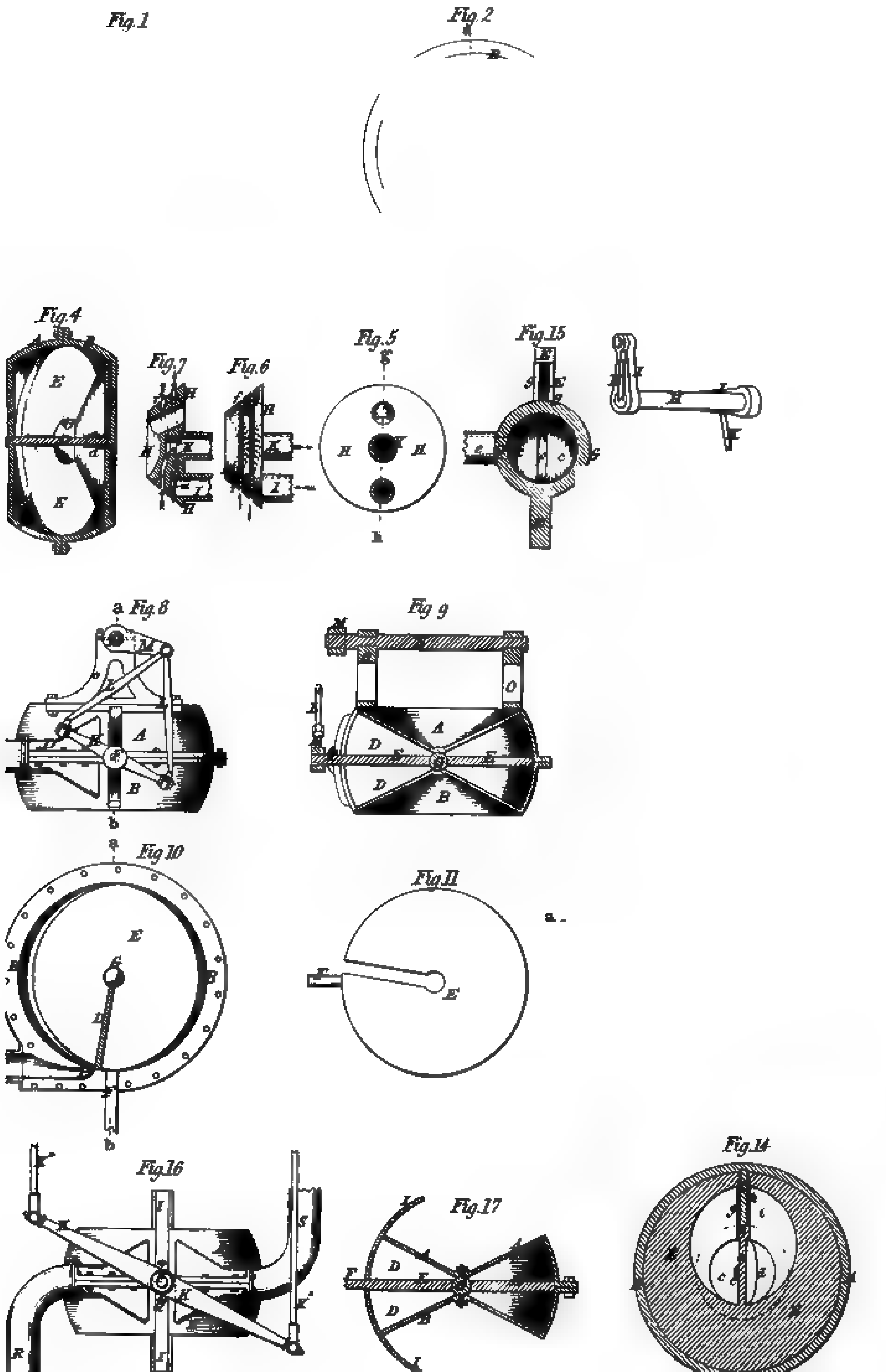
Milner's fire proof safe

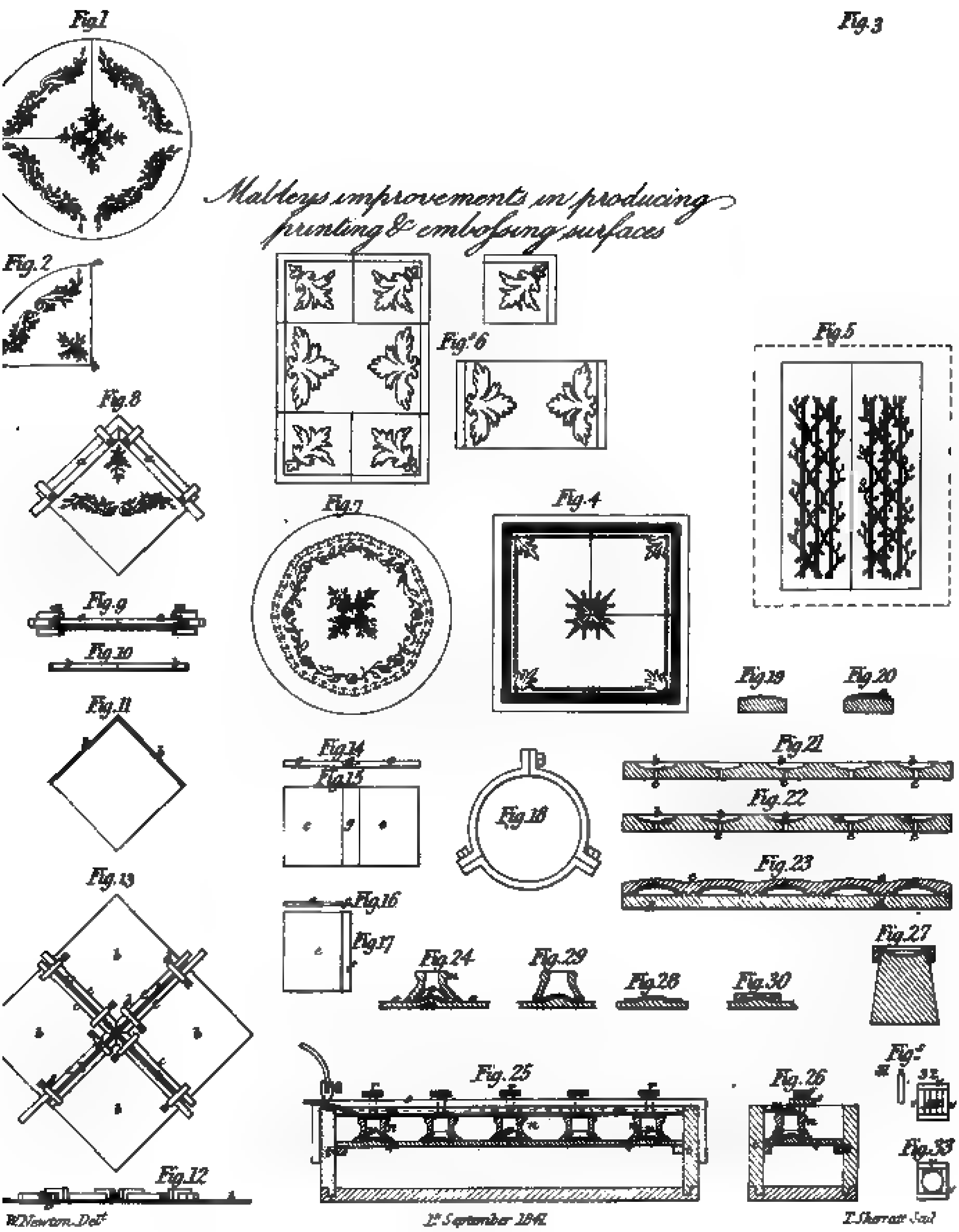
Fig.1



…pton Del^t August 2^nd 1841 G. Ward

Davies's Mechanical Power

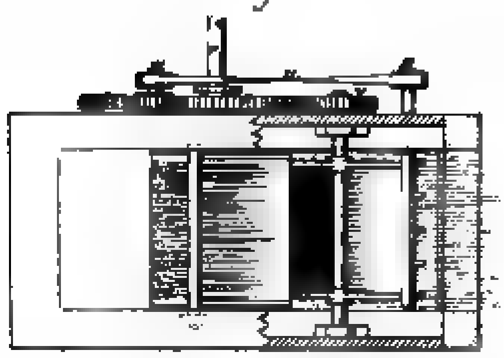




Mabley's improvements in producing printing & embossing surfaces

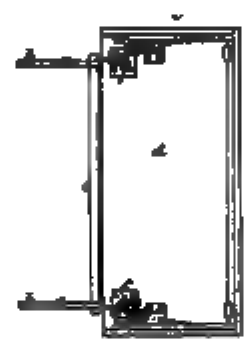
W. Newton Del.^t 2^d September 1841 T. Sherratt Sculp

Fig. 2



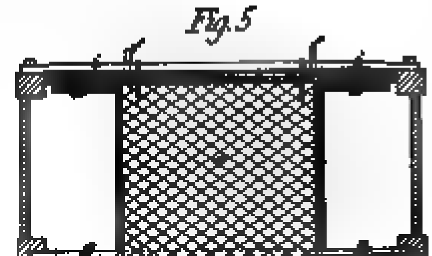
Atkinson's improved thrashing machine

Fig. 1



Roberts' improved fire escape

Fig. 5

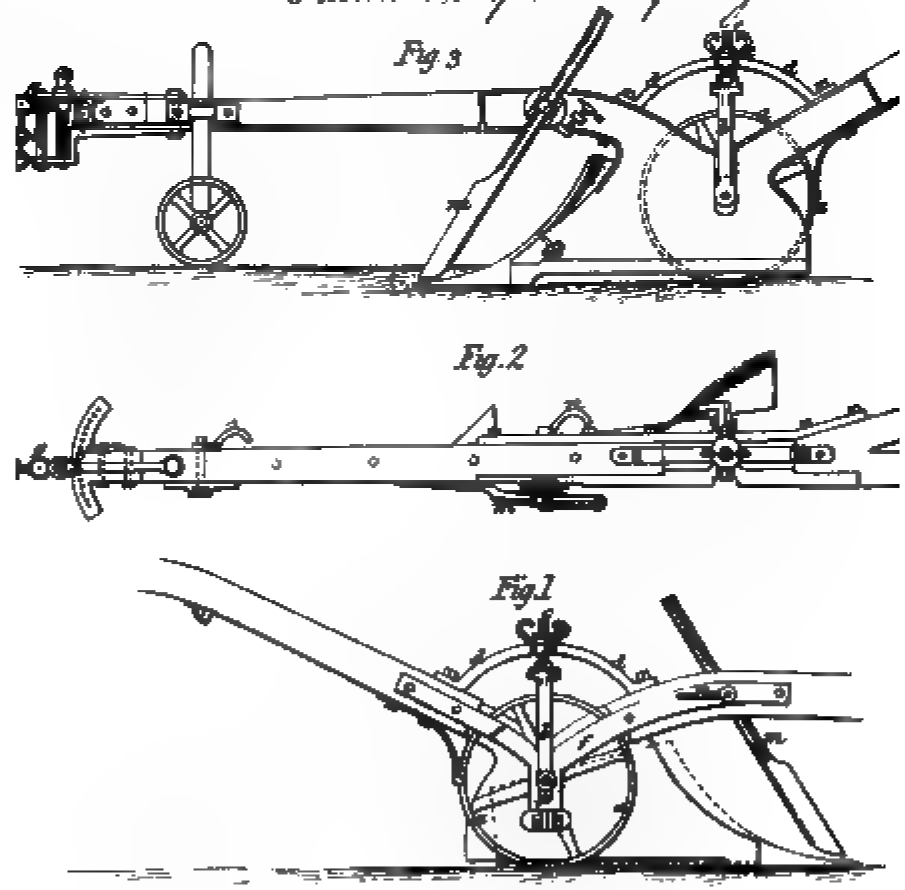


&c. Palm..'s improved plough

Fig. 3

Fig. 2

Fig. 1



Han... &c.

Fig. 1

Fig. 2

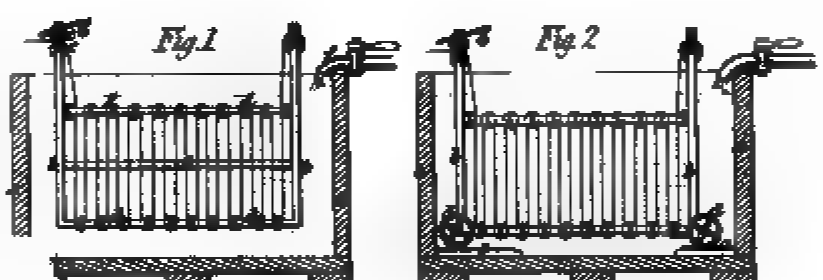
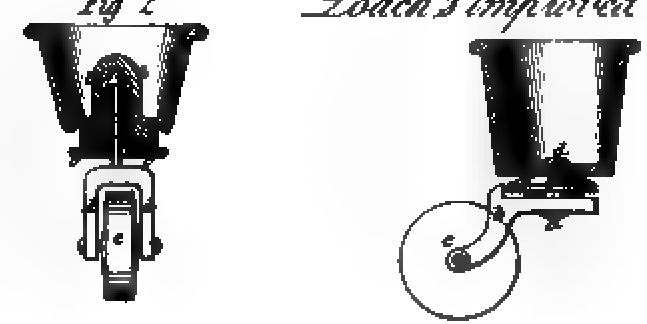


Fig. 2

Loach's improved castor



...wern Del.

7th September 1861

E. Mansell Sculp.

Davies' rotatory engine

Fig.1

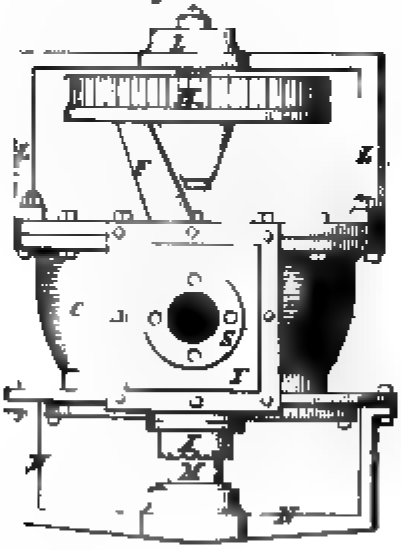


Fig.5

Fig.4

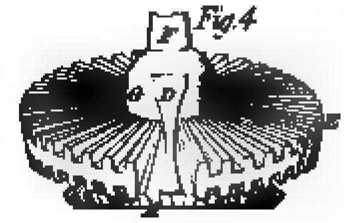


Fig.3

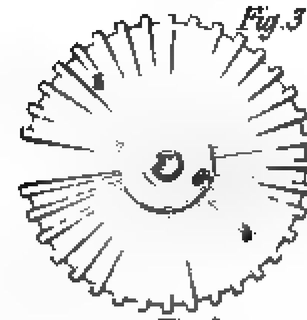


Fig.6

Fig.11

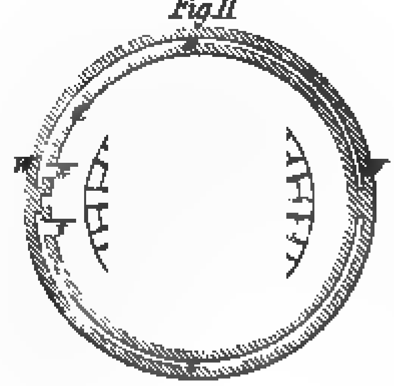
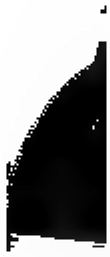


Fig.J



Fourdrinier's steam engine

Fig.1

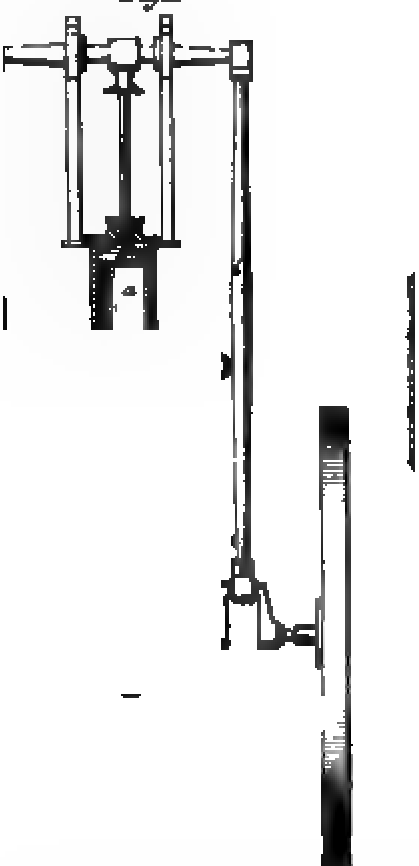


Fig.4

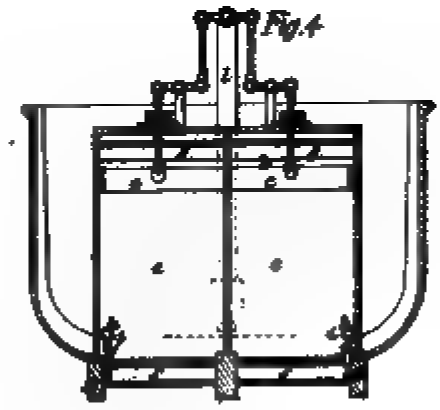
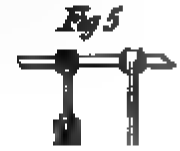


Fig 5



Gilbert's motive power

Fig.1

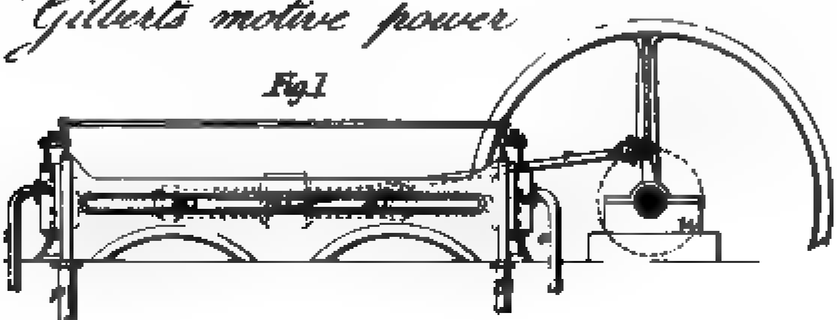


Fig.2

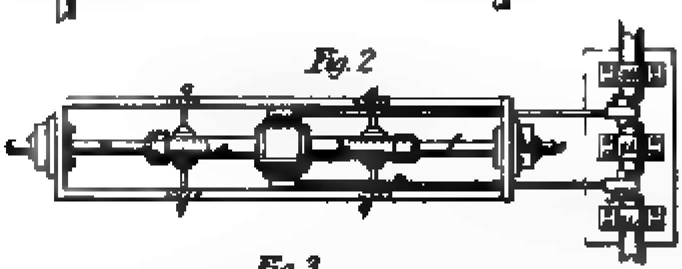


Fig 3

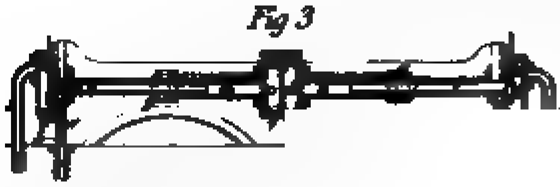
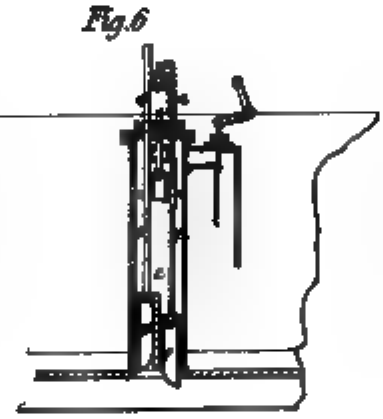


Fig.6



Lanes' feather dressing apparatus

...tter's calico pr...

Fig.1

Newton Del.

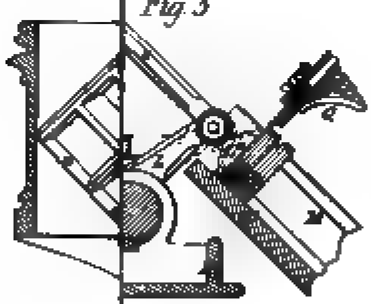


Fig. 3

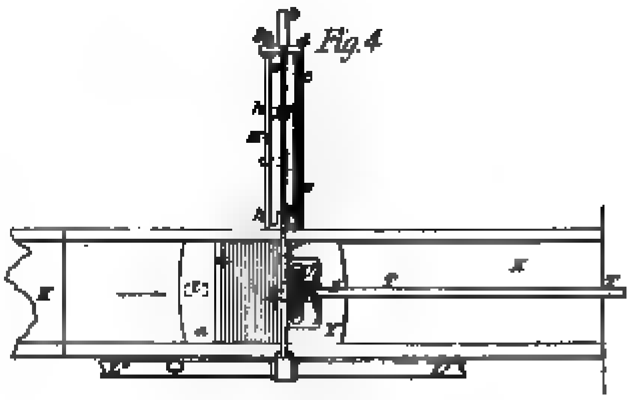


Fig. 4

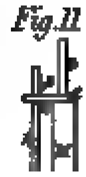


Fig. 11

Fig. 6

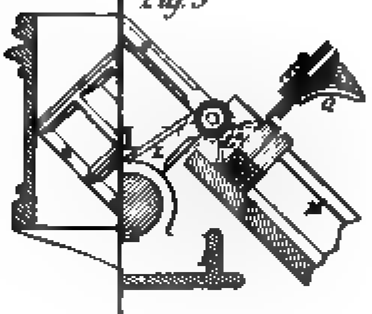


Fig. 3

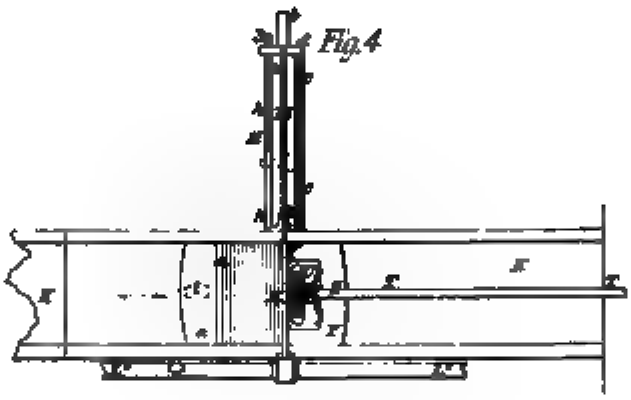


Fig. 4

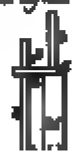


Fig. 11

Fig. 6

Fig

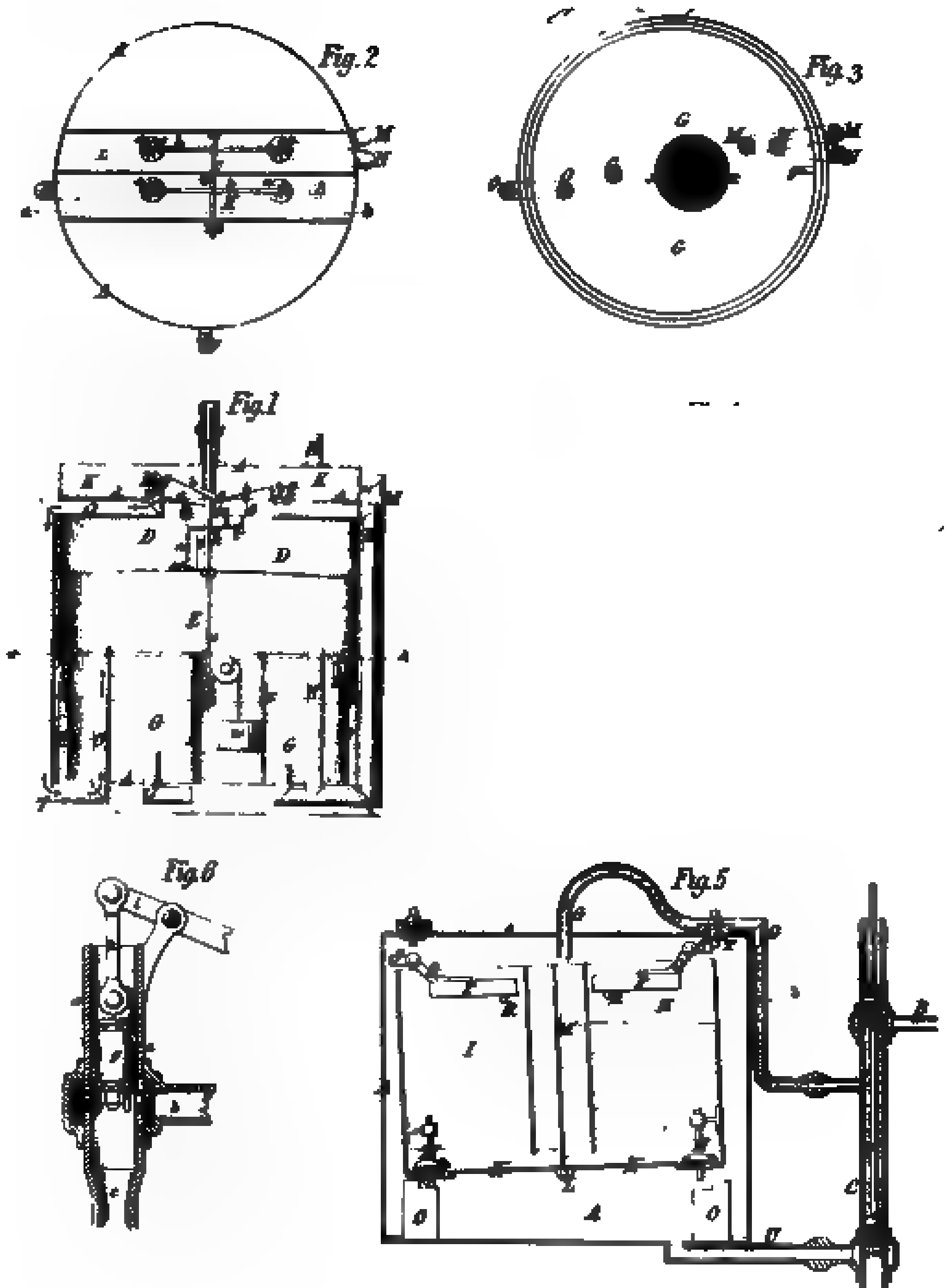
Fig. 3

J. Newton Delt.

November 1st 1794

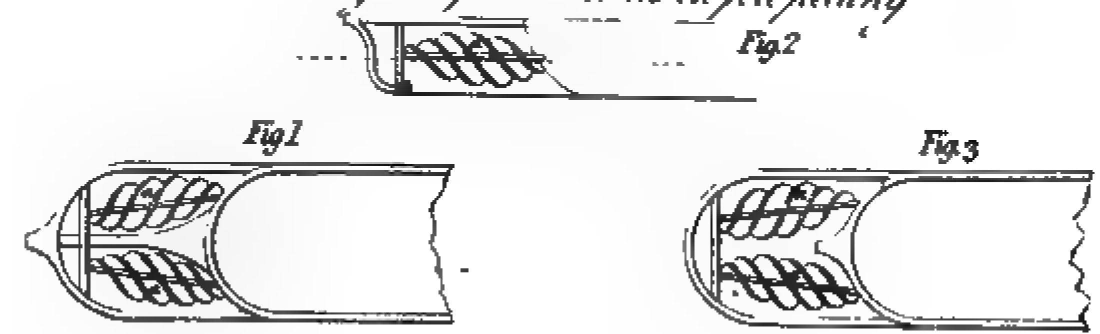
Basire Sculpt.

Fig. 2 Fig. 3 Fig. 1 Fig. 6 Fig. 5



Berry's improvements in propelling

Fig. 2 Fig. 1 Fig. 3



Miller's improved furnace grates

Fig. 1

Fig. 3

Fig. 5 Fig. 4

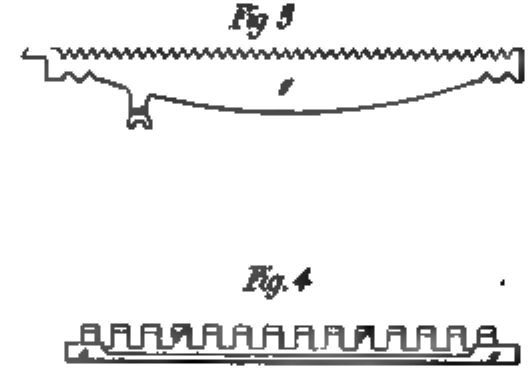


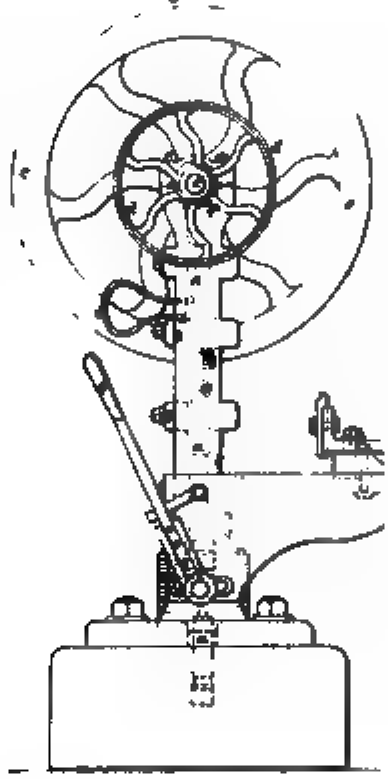
Fig. 2

... Del.

November 1st 1842

G. Gladwin Sculpt.

Fig.1 *Ryder's apparatus for forging spindles*



Unsworth's imp.ts in drying and finishing woven goods

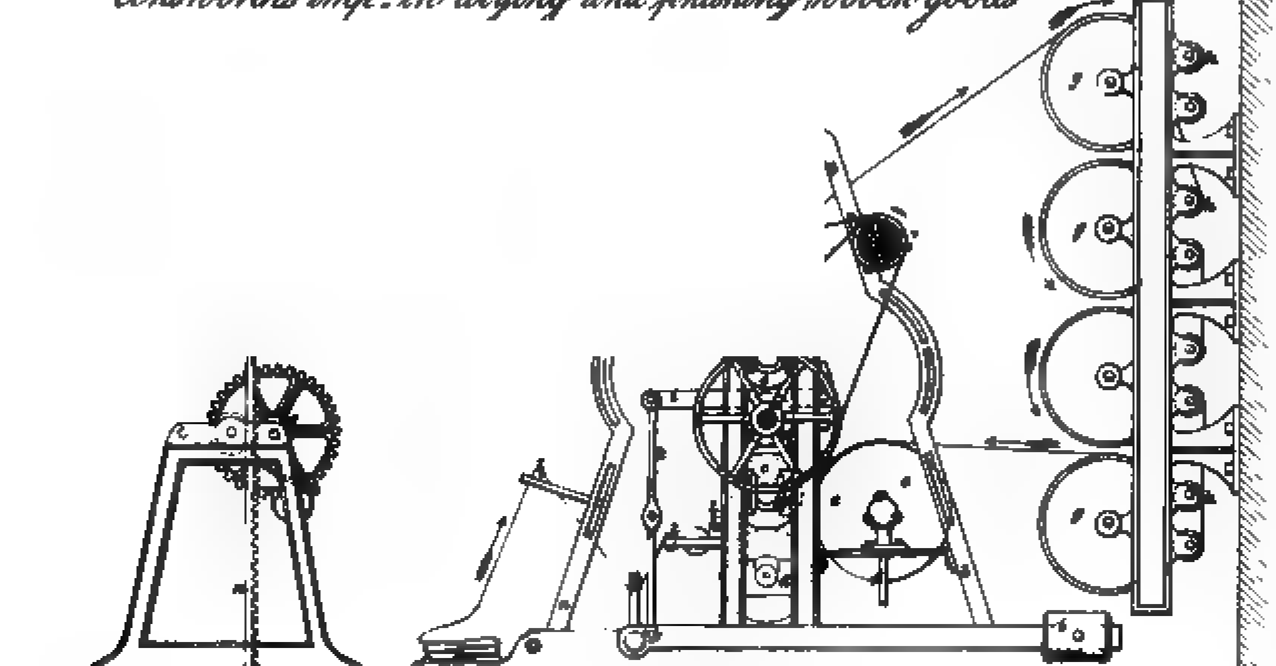
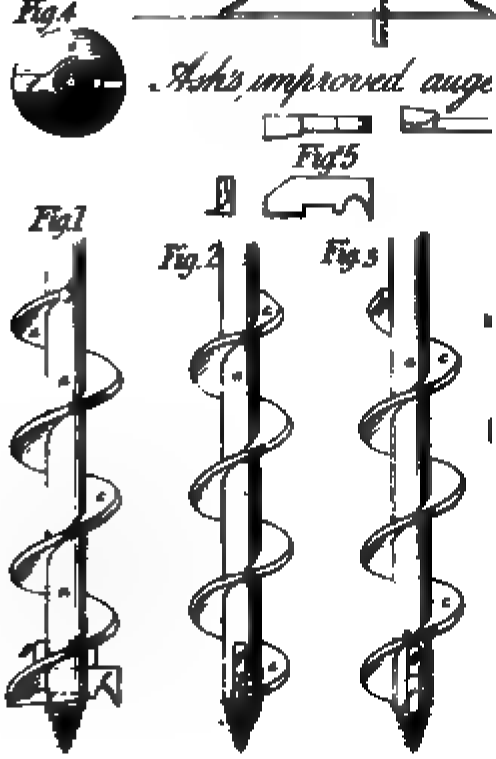


Fig.4 *Ash's improved auge*

Fig.5

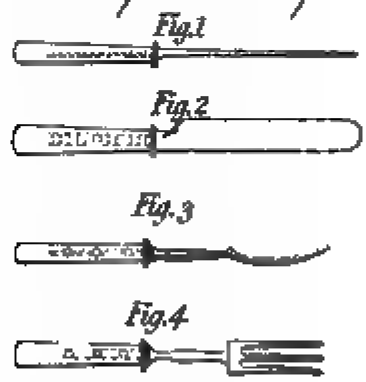
Fig.1 Fig.2 Fig.3



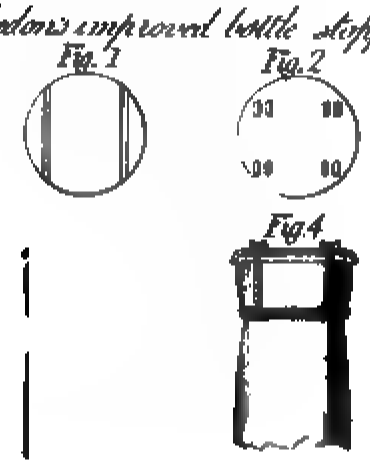
W Newton Del.

PLATE XIII

Roberts' improved knife handle



Brockedon's improved bottle stopper



Hendrey's Flooring

PLATE XIII

Fig. 3

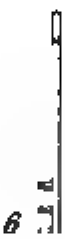


Fig. 6

Roberts improved knife handle

Fig. 1

Fig. 2

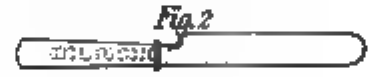


Fig. 3

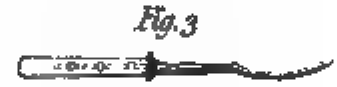
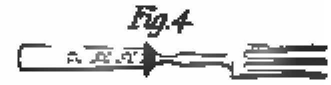


Fig. 4



Brockedons improved bottle stopper

Fig. 1

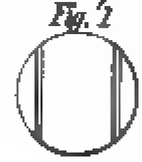


Fig. 2

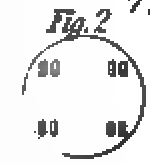
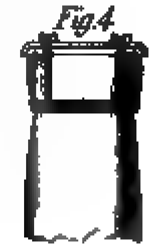


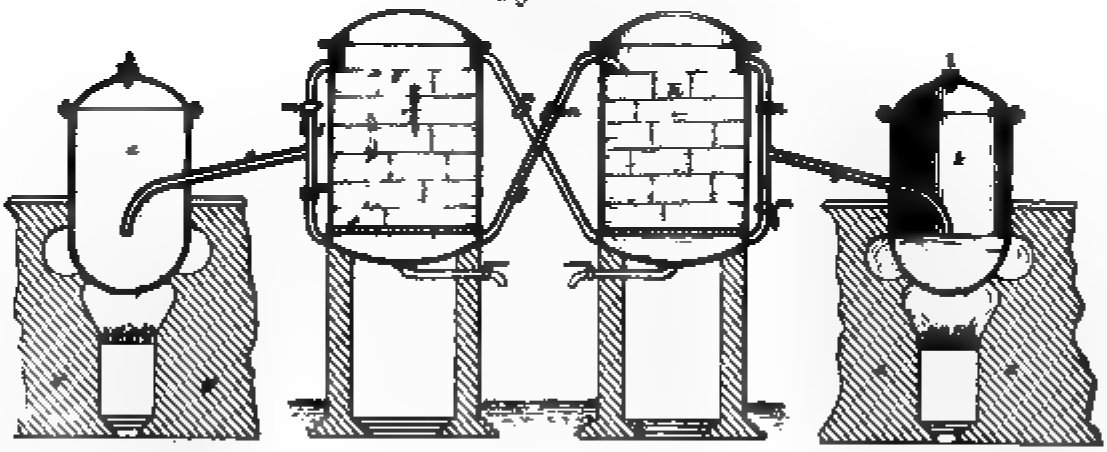
Fig. 4



Hendrey's Flooring

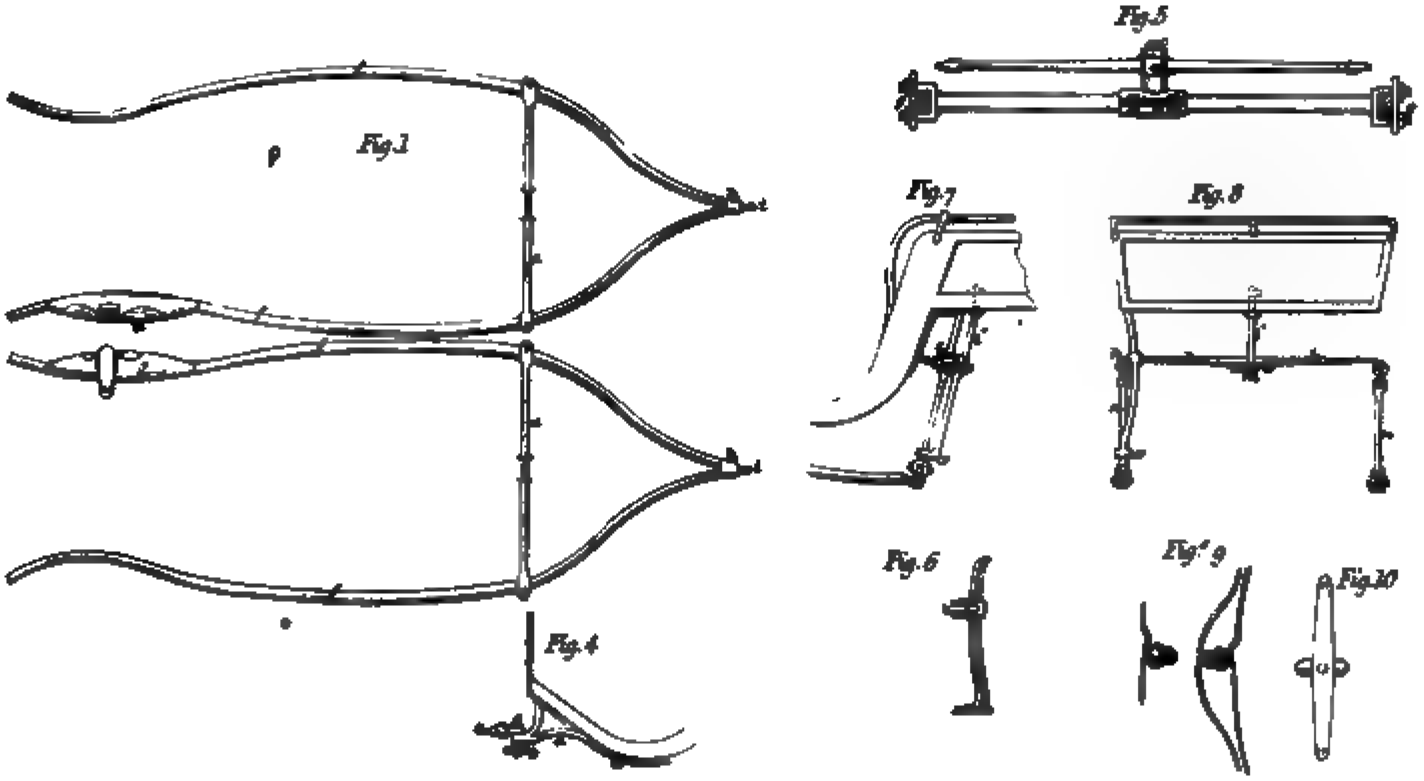
Knight's improved bleaching apparatus

Fig. 1



Maughan's improved carriage

Fig. 2 Fig. 3



W. Newton, Delt Decr 1, 1842. G. W.

Earl Ducie R. Clyburn & E. Budding's impts in cutting vegetables & other substances

Fig.4

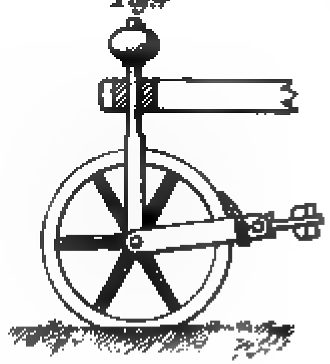


Fig.9

Fig.7

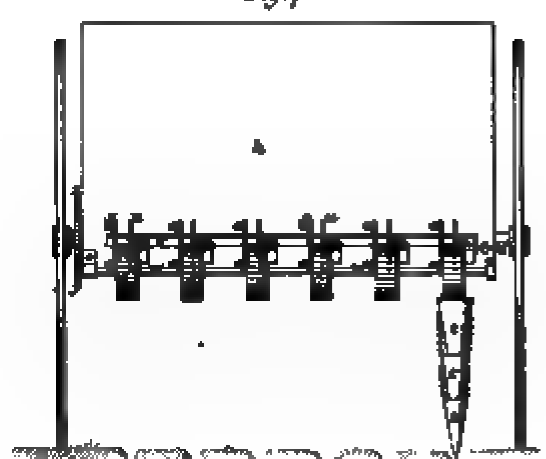
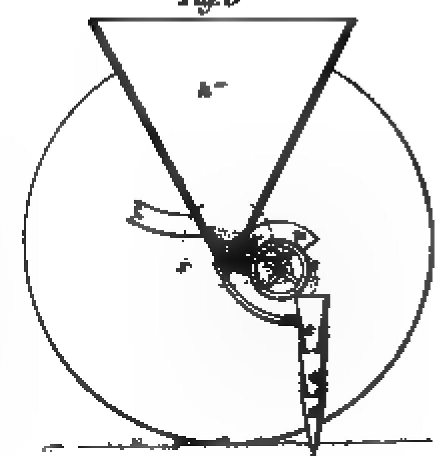
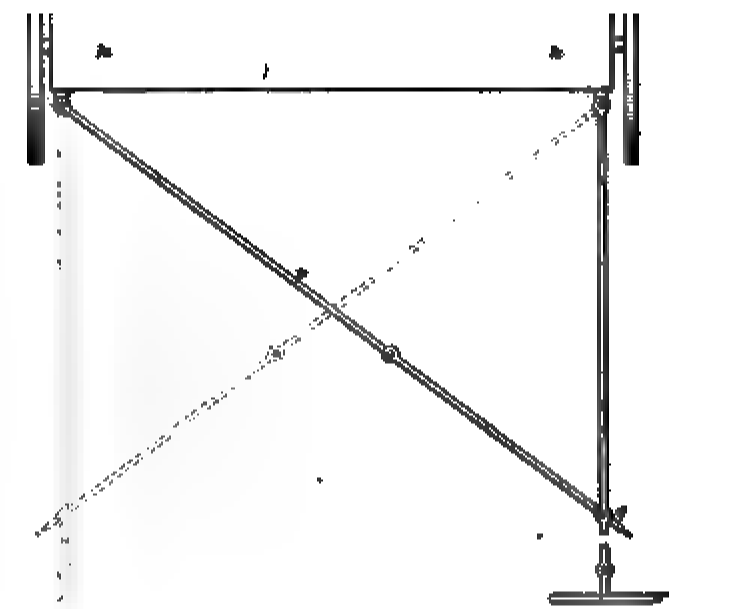


Fig.8





V. Newton Delt

1st January 1848

G. Gladwin Sculpt

Mackinlay's machinery for folding goods

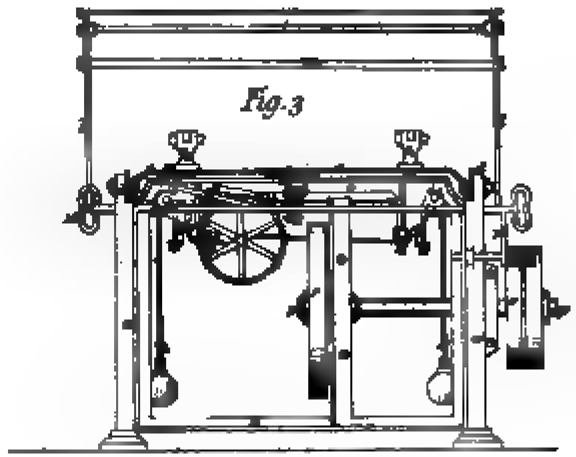


Fig. 3

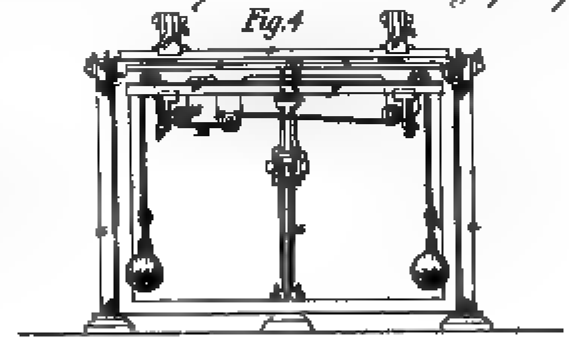


Fig. 4

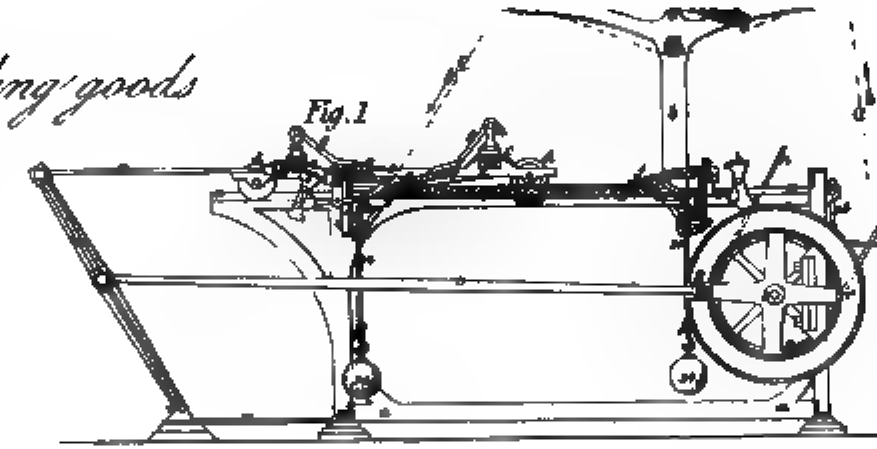
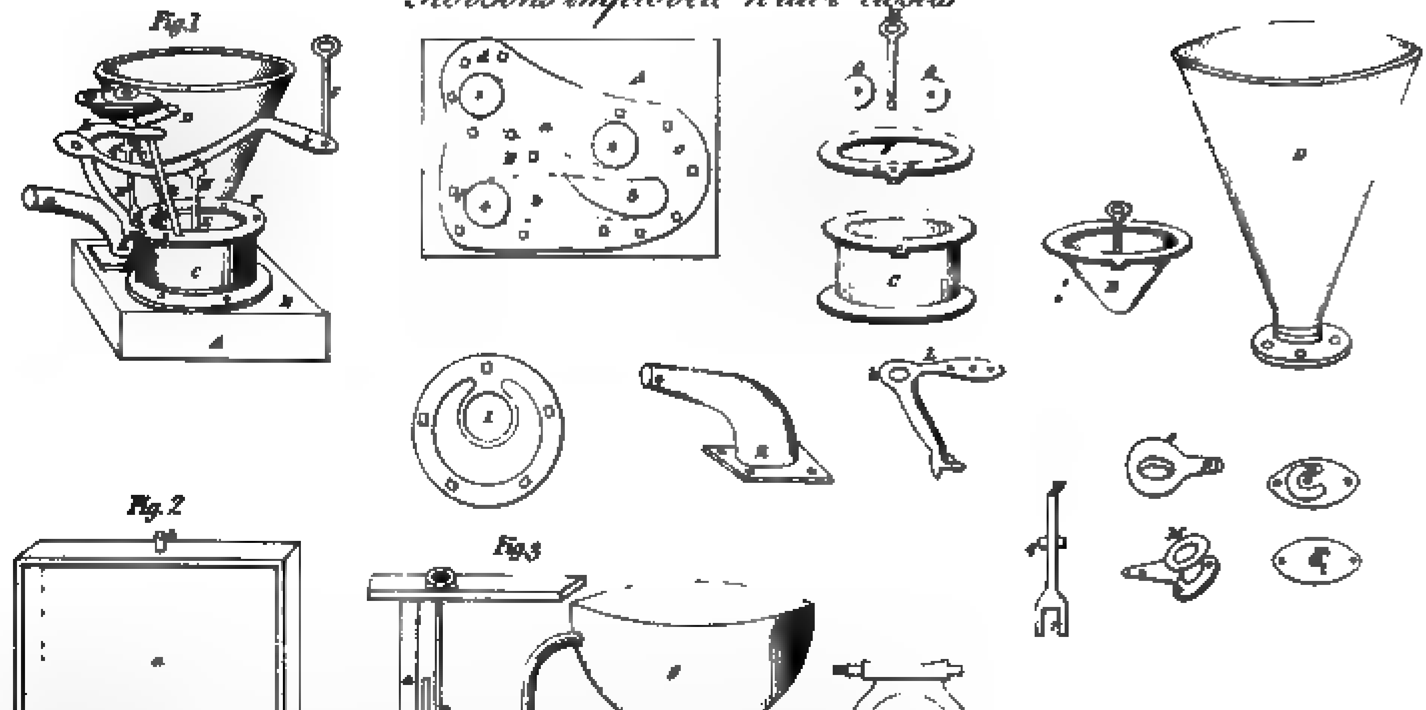
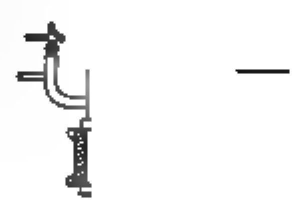


Fig. 1

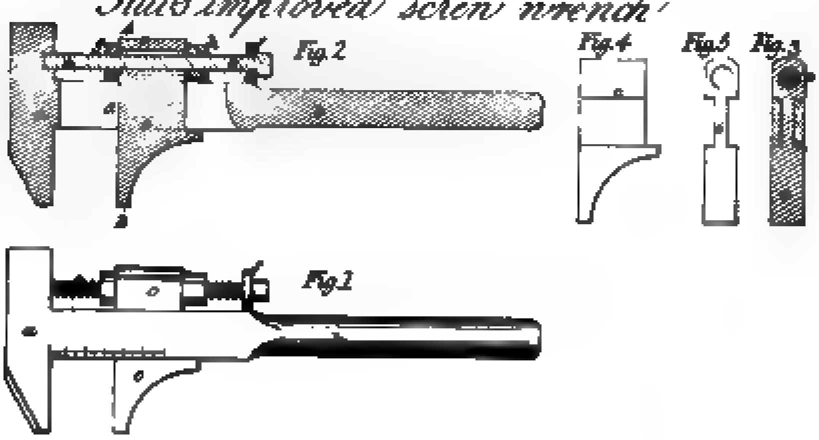
Robson's improved water closets



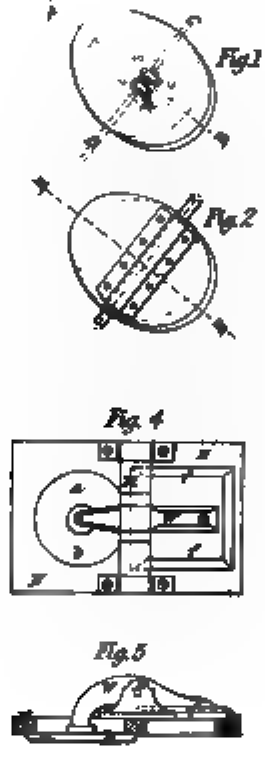
Oram's hydraulic press



Stuls' improved screw wrench



Palmer & Perkins' pistons & valves



Clark's improved locks